

Standards of Cover

WASHOE COUNTY

VOLUNTEER FIRE AGENCIES

Prepared by:



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The All Risk Standards of Cover was produced under the direction of the Washoe County Nevada County Commissioners, Washoe County Manager Katy Simon and Washoe County Fire Service Coordinator Kurt Latipow.



The All Risk Standards of Cover compiled by
Diamante Partners



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Washoe County Fire Coordinator

Washoe County Manager

Washoe County Volunteer Fire Agencies

The County of Washoe Requested in its RFP2662-09 the following scope of work:

12.1.3 Conduct a Standards of Response Cover Deployment Analysis. This approach uses risk and community expectations on outcomes to assist fire department leadership and elected officials in making informed decisions on fire and EMS deployment levels. The Standards of Response Cover process consists of eight parts:

1. Existing deployment- each agency has something in place today
2. Community outcome expectations-what is expected of the response agency
3. Community risk assessment- what assets are at risk in the community
4. Critical Task Time Study- what must be done over what time frame to achieve the stated outcome expectation(s).
5. Distribution Study- the location of first-due resources
6. Concentration Study-first alarm assignment or effective response force
7. Reliability & Historical response effectiveness studies-using prior response statistics to determine what percent of compliance the existing system(s) deliver
8. Overall evaluation-proposed standard of cover statements by risk type. Identify and prioritize critical deficiencies. Answer the question of what we need to do for the future.
9. Add item- Address future delivery system models including governance options as they may relate to the eight (8) previous questions

Diamante Partners have responded and offered the following solution:

Standards of Cover Deployment Analysis: Methodology and Approach Summary

Goal:

*Fire Protection and Emergency Medical Delivery Systems are based on an acceptable risk. The focus of the Standards of Cover (SOC) study for Washoe County that will be conducted by **Diamante Partners LLC** will be to ensure that necessary community stakeholders and elected officials have the opportunity to make informed decisions on what that acceptable risk is and accordingly determine the distribution and concentration of fixed and mobile resources of designated fire and EMS organizations.*

Our Approach:

The Diamante Team will conduct a series of face-to-face community/regional meetings as well as incorporate the use of a web based survey tool to gather input from community stakeholders on expectations of service delivery, given different variables or scenarios. Data collected as a result of this outreach will serve as a valuable tool for elected officials to help them determine priorities for the future. The study will evaluate the eight major components of a SOC utilizing national, state and local standards. Information and guidelines (*risk, department decisions, resource distribution, concentration, and staffing of line companies, etc*) set forth by the following organizations will be reviewed and incorporated into the study:

- 1 International Association of City Managers and the International Association of Fire Chiefs, Commission of Fire Accreditation International (CFAI) ;
- 2 National Fire Protection Association (NFPA);
3. Insurance Services Organization (ISO);
4. International Code Council (ICC), fire and life safety codes; and,
5. Occupational Safety and Health Agency (OSHA) standards
6. NRS 474

The SOC will serve as a baseline for the current condition of the Fire Protection and Emergency Medical Delivery System. The Diamante Team will ask that local officials' adopt the final SOC by ordinance, to establish each jurisdiction "standards". This adds a layer of protection to each jurisdiction for liability purposes and will allow a platform to analyze the cost of fire protection and emergency medical services and an opportunity to determine how to methodically improve the system. A SOC is a critical component (baseline) for a master plan.

Our Methodology:

In the development of the SOC Study, the Diamante Team will utilize a "systems" approach to deployment rather than a one-size-fits all prescriptive formula. In a comprehensive approach, each agency should be able to match local need (risks and expectations), with the costs of various levels of service. In an informed public policy debate, each level of governing board "purchases" the fire and EMS protection (insurance) the community needs and can afford.

All Eight Components of Standards of Cover Systems will be addressed:

1. Existing deployment
2. Risk identification
3. Risk expectations
4. Service level objectives
5. Distribution
6. Concentration
7. Performance and reliability
8. Overall evaluation

Existing Deployment Policies

All agencies have existing policies, even if they are undocumented or adopted by the locally responsible elected officials. Originally, stations and equipment were located to achieve certain expectations. Diamante will look at how and why policies were developed and resources placed to gain historical perspective and an understand and described and contrasted to any proposed changes.

Building Risk Identification and Assessment

Diamante will build a Risk Identification and Assessment consisting of three elements:

- **Fire Flow:** The amount of water to control the emergency, which is based on structure, contents and exposures.
- **Probability:** The likelihood that a particular event will occur within a given Period of time or over a period of time.
- **Consequence:** Includes two components - Life Safety (the amount of emergency personnel and equipment to rescue or protect the lives of an occupant from life threatening situations); and Economic Impact (the losses of property, income or irreplaceable assets).

Building Risk Assessment is performed at three levels of measure:

- **Occupancy Risk:** Diamante will make an assessment of the relative risk to life and property resulting in a fire inherent in a specific occupancy or in a generic occupancy class.

- **Demand Zone:** An area used to define or limit the management of a risk situation. A Demand Zone can be a single building, or a group of buildings. It is usually defined with geographical boundaries and can also be called fire management areas or fire management zones. Sometimes Demand Zones are a department's data reporting areas from which historical workload can be defined, or DZ's could be a Planning Department data area that could be used to identify and quantify risks with the area.
- **Community:** Diamante will review the overall profile of the community based on the unique mixture of individual occupancy risks, Demand Zone risk levels and the level of service provided to mitigate those risk levels.

EMS and specialty incident response risk assessment and outcome expectations will also be performed using the criteria from identified disciplines. For example, an EMS risk category could be trauma patients, with an expectation to stabilize and transport trauma patients to a designated trauma center within one hour of the accident occurring.

Risk Expectations

Diamante will take what we have found regarding what the risks exist in a particular area or community and recommend policies/procedures on how to deal with the risk. Example recommendations include: Respond to emergencies in risk areas? Deliver prevention and education programs to minimize risks? Or Mitigation and/or control of risks?

Service Level Expectations

After understanding the risks present in a particular area or a community, the Diamante Team will identify what control measures community stakeholders and elected officials expect? For example, does the fire agency confine the fire to the compartment of origin, area of origin, floor of origin, or building of origin? In Washoe County, some agencies in sparsely populated areas with long response times like 30 minutes or more and might have to accept (not like) an exposure level of service where a building fire does not spread to the adjoining forest and start a conflagration. In EMS we might expect to get a trauma patient to the designated trauma center within the first hour. Each risk category found in a particular area or a community will have an outcome expectation developed for it.

Note that risks other than structure fires are typically EMS, special rescue like confined space, hazardous materials, airports and airplanes, etc.

Deployment – Distribution and Concentration

The Diamante Team will then evaluate resource deployment schemes, which are influenced by response time and create an effective response force for each risk category. Our study will include the locating of geographically distributed, first-due resources, for all-risk initial intervention. These station locations(s) are needed to assure rapid deployment to minimize and terminate average, routine emergencies. Distribution is measured by the percentage of the jurisdiction covered by the first-due units within adopted public policy response times. Recommended policies will include "benchmarks" for intervention such as arrival prior to or at flashover; arrival on EMS incidents prior to brain death in cardiac arrest. From risk assessment and benchmark comparisons, the jurisdiction will use critical task analysis to identify needed resource distribution and staffing patterns.

A sample distribution policy statement could be:

"For 90% or 4 minute response time of all incidents, the first-due unit shall arrive within six minutes total reflex time. The first-due unit shall be capable of advancing the first line for fire control or starting rescue or providing basic life support for medical incidents."

The Diamante Team will then look at resource concentration which would include the spacing of multiple resources arranged (close enough together) so that an “effective response force” can be assembled on-scene within adopted public policy time frames. An “initial” effective response force is that which will most likely stop the escalation of the emergency for each risk type. In addressing this task, we will consider risk category type - high-risk areas need second and third due units in shorter time frames than in typical or low risk areas. Concentration pushes and pulls distribution and there is no one perfect mathematical solution. Each agency after risk assessment and critical task analysis has to be able to quantify and articulate why its resource allocation methodology meets the governing body’s adopted policies for initial effective intervention on both a first-due and multiple unit basis.

Performance and Reliability

Diamante will review and determine how reliable the Washoe County response system is; do agencies frequently see multiple calls for service (stacked, or queued calls) and do these degrade performance? Are there predictable times of the day, week or year when queued calls occur? Can these occurrences be controlled or can peak hour staffing be used through various models?

Overall Evaluation

Statistics may say one thing, but they may totally disagree with the real world experience. If so, the Diamante Team find out why and keep studying until the numbers come close to reality. Then based on good data, compare and contrast the study findings to community needs, expectations and the ability to afford. **All elected officials will then be presented with a cost-benefit analysis and final plan, not just a recommendation for a change.**

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STANDARDS OF COVER OVERVIEW

One major issue the fire service has struggled with in the past decade is defining levels of service. There have been many attempts to create a standard methodology for determining how many firefighters, fire stations, or fire inspectors a community needs.

The diversity of fire service challenges in each community has defied efforts to create a “one size fits all” solution. It is not surprising therefore, that a national or state consensus has never been reached. To address this situation, the International Association of City Managers (ICMA) and the International Association of Fire Chiefs (IAFC) formed the Commission on Fire Accreditation International (CFAI).

This process uses a “systems” approach to deployment rather than a one-size-fits all prescriptive formula. In a comprehensive approach, each agency should be able to match local need (risks and expectations) with the costs of various levels of service. In an informed public policy debate, each city council or governing board “purchases” the fire and EMS protection (insurance) the community needs and can afford.

If resources arrive too late, or are under-staffed, the emergency will continue to escalate drawing more of the agency’s resources into a losing battle. Fire companies must, if they are to save lives and limit property damage, arrive within a short period of time with adequate resources to do the job. To control a fire before it has reached its maximum intensity requires geographic dispersion (distribution) of technical expertise and cost-effective clustering (concentration) of apparatus for maximum effectiveness against the greatest number and types of risk. Matching arrival of resources with a specific point of fire growth or medical problem severity is one of the greatest challenges of chief fire officers today.

Some medical emergencies such as multiple car accidents on a freeway, or industrial accident rescues, require speedy arrival of multiple crews to control the scene, perform rescue operations, and provide medical care. A high-risk area requires timely arrival of fire companies for several reasons. More resources are required to rescue people trapped in a high-risk building with a high occupant load than in a low-risk, building with a low occupant load. More resources are required to control fires in large, heavily loaded structures than are needed for small buildings with limited contents.

There are usually three reasons to redo or challenge existing levels of service - expansion, contraction of service areas (typically the result of a reduction in service area, a decline in risk or value, or a decline in available fire protection funding), and change in risk expectations.

Regardless of the reasons, elected officials should base changes in levels of service on empirical evidence and rational discussion leading to effective, informed policy choices.

Washoe County is a very large County covering a total area of 6,551 square miles. Three Major Volunteer Fire Companies protect the northern half of the County of Washoe, those volunteer companies are Red Rock, Sutcliffe and Gerlach Volunteer Fire Departments. Volunteer fire departments have historically suffered from lack of training, outdated equipment, and volunteer personnel who may not be available when the emergency call is placed to 911. The following information about volunteer fire departments has some influence on this Standards of Cover document.

Historical Background on Volunteer Staffing Issues

Contemporary concerns about volunteer firefighter staffing problems began with the President's National Commission on Fire Prevention and Control, established in 1968. As a result of the commission's 1973 report, *America Burning*, the National Fire Prevention and Control Administration (NFPCA) was created in 1974. The NFPCA provided federal leadership to the states to help them create state programs for fire education, training and research.

Declining Volunteers

Since the early 1970s, state and local governments have been concerned with the decline in volunteer firefighters. A 1993 study published by the National Association of State Foresters reported a national drop in active volunteer firefighters from 884,600 in 1983 to 815,500 in 1993, an 8 percent decline in 10 years. Explanations for declines in volunteer firefighters have been attributed to national social changes, difficulties in finding new volunteers, and problems with retaining existing volunteers. According to a 1998 National Volunteer Fire Council and U.S. Fire Administration report, *Retention and Recruitment: Problems and Solutions*, 11 factors have contributed to reductions in the number of men and women joining and remaining in the volunteer fire service. These 11 factors included:

- Time demands
- Training requirements
- Increasing call volume
- Changes in the 'nature of the business' of firefighting
- Changes in urban and suburban populations
- Changes in sociological conditions (two-income families and time demands)
- Leadership problems
- Federal legislation and regulations
- Increasing use of combination departments
- Higher cost of housing (in affluent communities)
- Aging communities

The impact of these and other factors has made it more difficult for VFCs to recruit and retain members.

An unpublished State University of New York at Buffalo Ph.D. dissertation (Sargent, 1992) on satisfaction and retention of volunteer firefighters found that altruism ranked first as the most satisfying reason for volunteering. The eight top reasons for active firefighters to stay on the job were:

- Altruism
- Skills
- Thrills
- Work environment
- Management
- Social relations
- Material issues
- Recognition.

Retention policies identified as important by the active volunteers were management quality and skill development, quality of the work environment, and altruism. The researcher also noted that the lack of VFC leadership and management skills might be retention issues worthy of further investigation. Throughout the U.S., the average VFC had 25 active members.

Source: United States Fire Administration

Communities within the Washoe County Volunteer Fire Departments

The Assessed Valuation of the Washoe County Volunteer Fire Departments is estimated at \$86,286,930.

Red Rock

The Red Rock community is located near the western boundary of Washoe County, east of the Peterson Mtn. Range and north of the Communities of Cold Springs and Silver Knolls. The Southeast extent of this community is bounded by Fred's Mountain, Antelope Valley, and the Bedell Flat Area from the T22N line to the Bird Spring Cut off and the Sand Hills. Red Rock Rd is the Primary N/S access and the only paved road through the area. Secondary access can be made through Hungry Valley to the east by improved dirt roads. Occupancies are primarily single family residences and Ranchettes with livestock. A Wildlife sanctuary exists adjacent to Fred's Mountain with many species of wild animals some including large cats and bears.

Red Rock



Rancho Haven

The Red Rock community is located near the western boundary of Washoe County, east of the Peterson Mtn. Range and north of the Community of Rancho Haven. The eastern Boundary borders the Sand Hills and Dry Valley and extends to Seven Lakes Mountains to the North. While the community is named Rancho Haven, it lies within the Red Rock Valley. The primary paved road is Red Rock Road. The Community can be access on an poor unpaved road from the Dry Valley, Hungry Valley areas. The North entrance and exit of the Valley is in California and is accessed from US 395. It is faster for units responding from the North valleys area to utilize US 395 in California for access to the northern ends of the valley. Occupancies are primarily single family residences and Ranchetts with livestock.

Sutcliffe

The Sutcliffe community is located within the Pyramid Lake Paiute Reservation, about forty miles northeast of Reno and twenty miles northwest of Nixon on State Route 445. Residences in the community are concentrated along the lower alluvial fan of the Virginia Range where Hardscrabble Creek terminates into Pyramid Lake. The residences extend approximately two miles north and south along State Route 445 and approximately 0.5 miles to the east and west of State Route 445. Access to Sutcliffe is limited to State Route 445, which is the only paved road into and out of the community. Sutcliffe Drive intersects with State Route 445 and is the main loop road through the community. There are several secondary streets and dirt roads in the community.

Sutcliffe



Gerlach

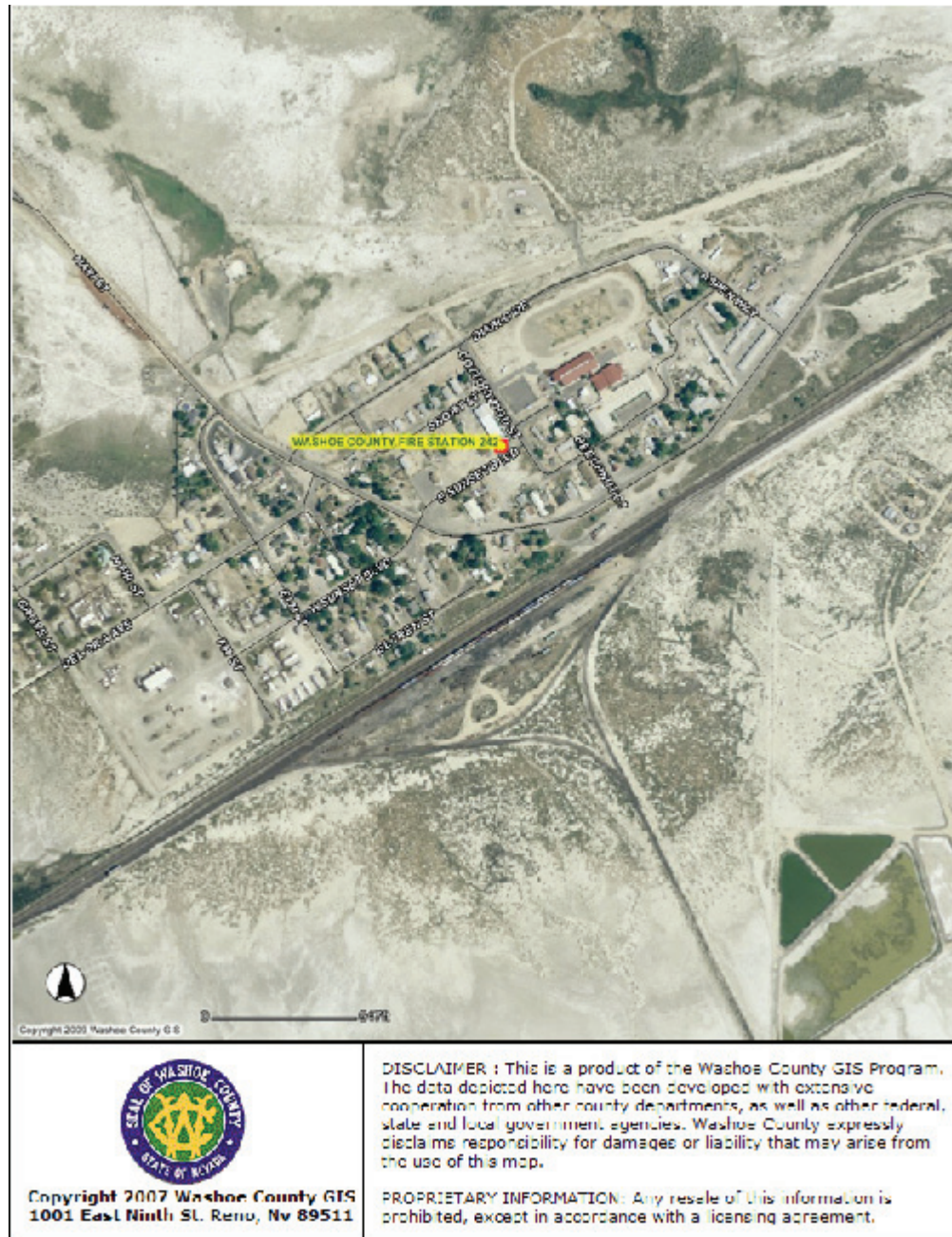
Gerlach is located in northern Washoe County, approximately 100 miles north of Reno. The community is situated in the flats, south of the Granite Range along State Route 447. State Route 447 and State Route 34 are the primary transportation routes providing access to the community.

Economy

The economies of Gerlach and Empire focus on gypsum mining near Empire, tourism in the nearby Black Rock Desert, and hunting. Empire is the classic company town of the United States Gypsum Corporation (USG). All residents of Empire work for USG and USG owns the properties and buildings. The Empire gypsum mine is the longest continually operating mine in the US. Most mines were shut down during WWII as resources were diverted to the war. For some reason it was determined gypsum was 'essential' and this one never closed. The town has a church, a public pool, a 9-hole golf course, a post office, and Empire Airport for light planes. There is also a day care facility for the employees of Empire, and a convenience store with a gas station -- the only store for more than 50 miles. The other major industries are a Union Pacific switching station in Gerlach, Orient Farms garlic processing plant, San Emido geothermal plant South of Empire/Gerlach, Road Maintenance yard in Flannigan and public services of Washoe County (roads department and K - 12 public school). Many of the inhabitants of Gerlach are elderly retirees. There are 3 owner-operated bars in Gerlach; Bruno's Country Club, Bev's Miners Club, and Joe's Gerlach Club. Bruno's Country Club is a bar/restaurant with separate motel and gas station and has been a destination for travelers in the region for over 50 years, and is the only restaurant and motel for 80 miles.

Many people in Gerlach also have small private businesses. Many are Internet-based. Hunters from all over the west travel to Gerlach to hunt a wide variety of game such as chukar, geese, deer, antelope, etc. Since 1991, Burning Man, a week long countercultural festival with 47,000 participants (as of 2008), has been held nearby. Due to the appearance and actions of many of the participants, local enthusiasm is mixed, but the event is responsible for around 20% of the sales at the few commercial establishments in the area. The Black Rock Desert is also the site of many other recreational activities, organized and otherwise, throughout the year. There are large ranches in the expanses north to the Sheldon Antelope Refuge.

Gerlach



Gerlach- Empire Demographics

Total Population

554

Race

White	455
American Indian and Alaska Native	14
Asian	1
Some Other Race	23
Two or More Races	6
Hispanic or Latino	55

Housing Occupancy

Total Housing Units	297
Occupied Housing Units	234
Vacant Housing Units	63
Seasonal, Recreational or Occasional Use	12
Rental Vacancy Rate	18.4%

Household Type

Average Household Size	2.13
Average Family Size	2.71

Source: 2000 Census Data for Washoe County

Sutcliffe Demographics

Total Population

297

White	117
American Indian and Alaska Native	134
Native Hawaiian and Other Pacific Islander	2
Some Other Race	6
Two or More Races	22
Hispanic or Latino	16

Housing Occupancy

Total Housing Units	113
Occupied Housing Units	105
Vacant Housing Units	8
Seasonal, Recreational, or Occasional Use	3
Rental Vacancy Rate	3.2%

Household Type

Average Household Size	2.68
Average Family Size	3.21

Source: 2000 Census Data for Washoe County

Public Lands

Publicly owned lands encompass over 78 percent of land area of Washoe County. Public lands are owned by local jurisdictions, and state and federal agencies. Public lands have a variety of uses; and people often think of the lands as limitless community assets. However, not all lands will remain in public ownership. Pressures on land resources, as well as pressures of economy, may result in changing ownership to private entities. Nevertheless, planners anticipate that the majority of public land will remain under public control due to their overriding public benefit. State lands when Nevada became a state, it received title to all lands submerged beneath navigable bodies of water. State lands in Washoe County are under the jurisdiction of several state land agencies including the Division of Buildings and Grounds, the Division of State Parks, and the Division of Wildlife. Each agency is responsible for the management of the lands they are using. There are currently about 35,681 acres of state-controlled lands in Washoe County. Tribal Lands The Pyramid Lake Indian Reservation covers approximately 306,273 acres and is located in eastern Washoe County. The Paiute Indian Tribal Council administers its lands. Additionally, the Reno-Sparks Indian Colony owns approximately 160 acres of land in Lemon Valley and approximately 1,920 acres of land in Hungry Valley. The Reno-Sparks Indian Colony Tribal Council administers the land use in those areas. Land administered by the Bureau of Indian Affairs totals approximately 356,113 acres.

Federal Lands

Federal agencies administer approximately 3,320,483 acres of land in Washoe County. Each of the federal agencies has its own set of rules and policies for administration of its lands. Table 2 identifies the approximate number of acres in Washoe County managed by each of these agencies.

Federal Lands

Federal Agency Acres

Bureau of Land Management 2,682,204

Bureau of Reclamation 283

Department of Defense 1,732

Fish and Wildlife Service 185,756

Forest Service 94,395

Source: BLM 2005, DCNR Nevada Natural Resources Status Report 2002, and Nevada Division of State Lands 2005.

BLM

The Bureau of Land Management (BLM) is an agency that is under the authority of the Department of Interior. This agency is responsible for managing acres of public lands, along with below ground mineral estates. Originally, these lands were valued principally for the commodities extracted from them. Today, the public also prizes them for their recreational opportunities and their natural, historical and cultural resources they contain. An important part of the BLM's mission is to identify parcels for potential sale. Parcels are selected that fall into one of the following categories:

- Scattered and isolated tracts that are difficult or uneconomical to manage;
- Tracts acquired by the BLM for a specific purpose that are no longer needed for that purpose; or
- Land where disposal will serve important public objectives, such as community expansion and economic development.

The Northern Area is controlled by three different BLM management units between two states. That makes agreements and coordination challenging at times. There is the Carson District BLM that covers the southern part of the area, then there is the Surprise Valley Unit out of California that covers the bulk of the area from Gerlach North and then the Winnemucca District BLM that covers a small portion of the eastern part of the County area from Empire North.

UNITED STATES FISH AND WILDLIFE

The U.S. Fish and Wildlife Service is another agency that operates within the Department of Interior. Its mission is to work with others to conserve, protect and enhance fish, wildlife and plants and their habitats for the continuing success of the natural environment and enjoyment of all the world's people. Although the majority of fish and wildlife habitat are on non-federal lands, Washoe County has two wildlife refuges. The Sheldon National Wildlife Refuge is located in the far northern part of the County. Anaho Island is located in Pyramid Lake U.S. Fish and Wildlife Service has a large presence in the Sheldon Antelope Refuge and is headquartered in Ft. Bidwell, California.

BUREAU OF RECLAMATION

The Bureau of Reclamation is a water management agency that establishes methods for competing entities throughout the Western United States to meet water needs and balance competing water interests. Its mission is to assist in meeting the increasing water demands of the West while protecting the environment and the public's investment in these structures

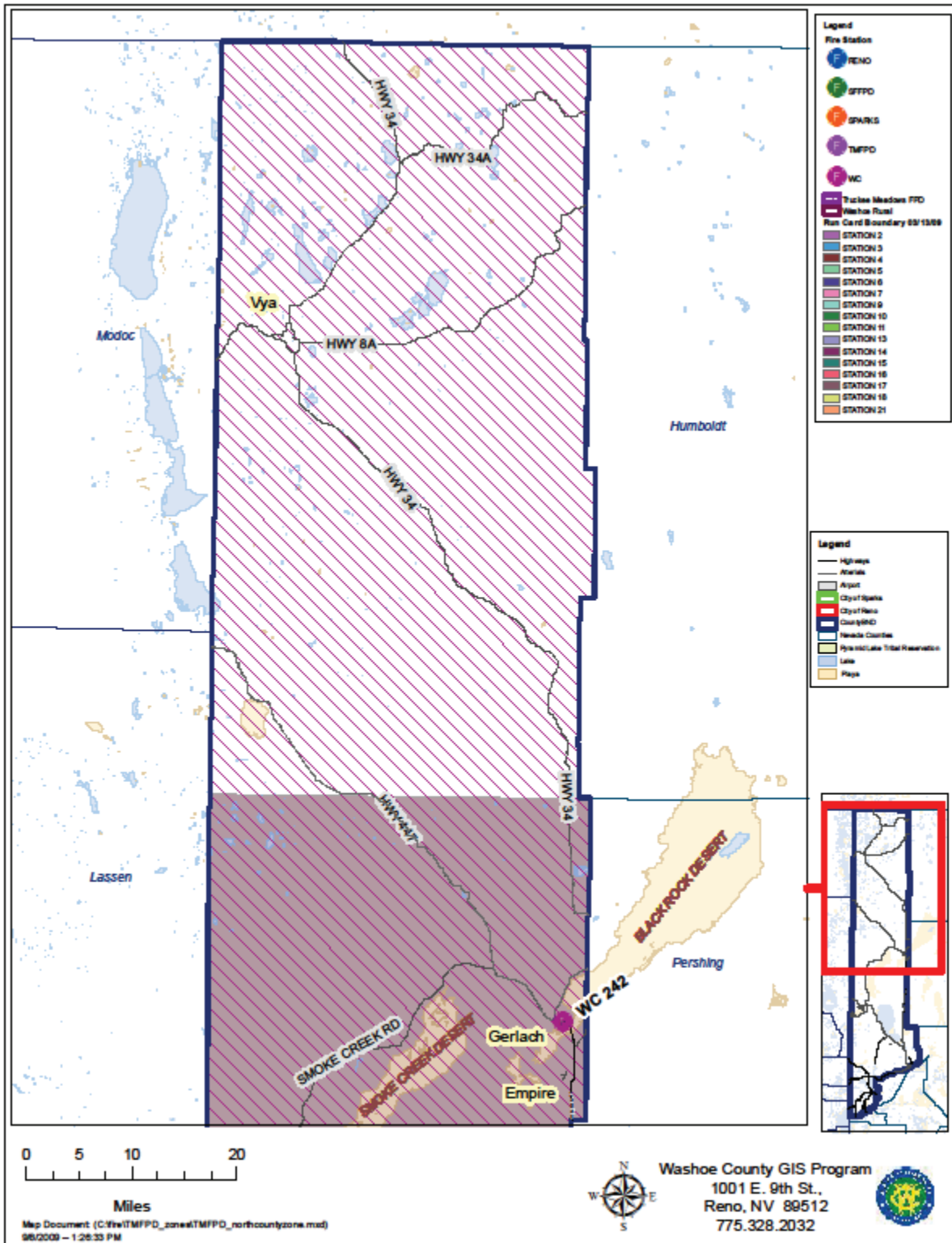
Recreational Bodies of Water

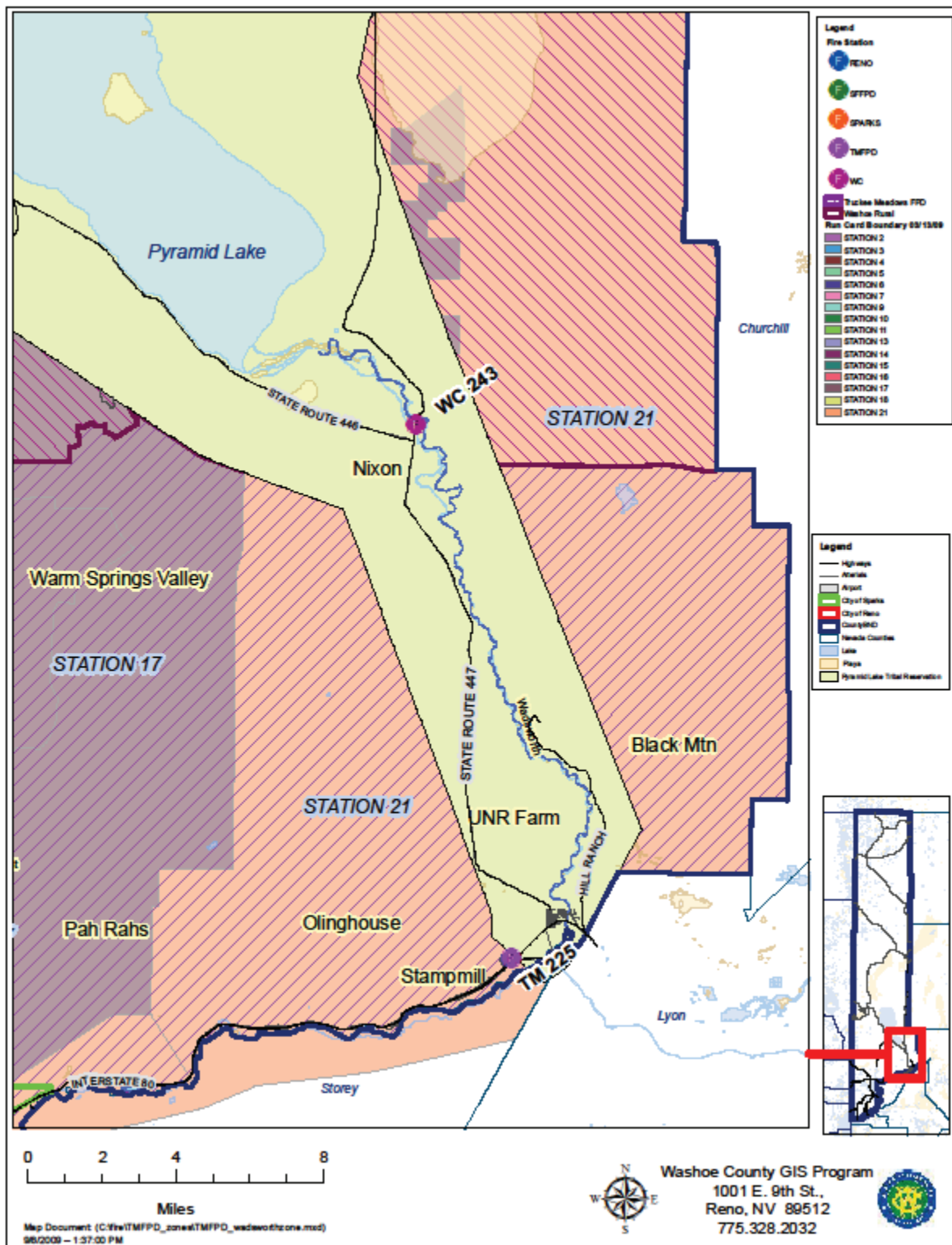
There are many static bodies of water that recreationist utilize such as Squaw Reservoir, High Rock Lake, Catnip Reservoir, Soldier Meadows, and Wall Canyon Reservoir.

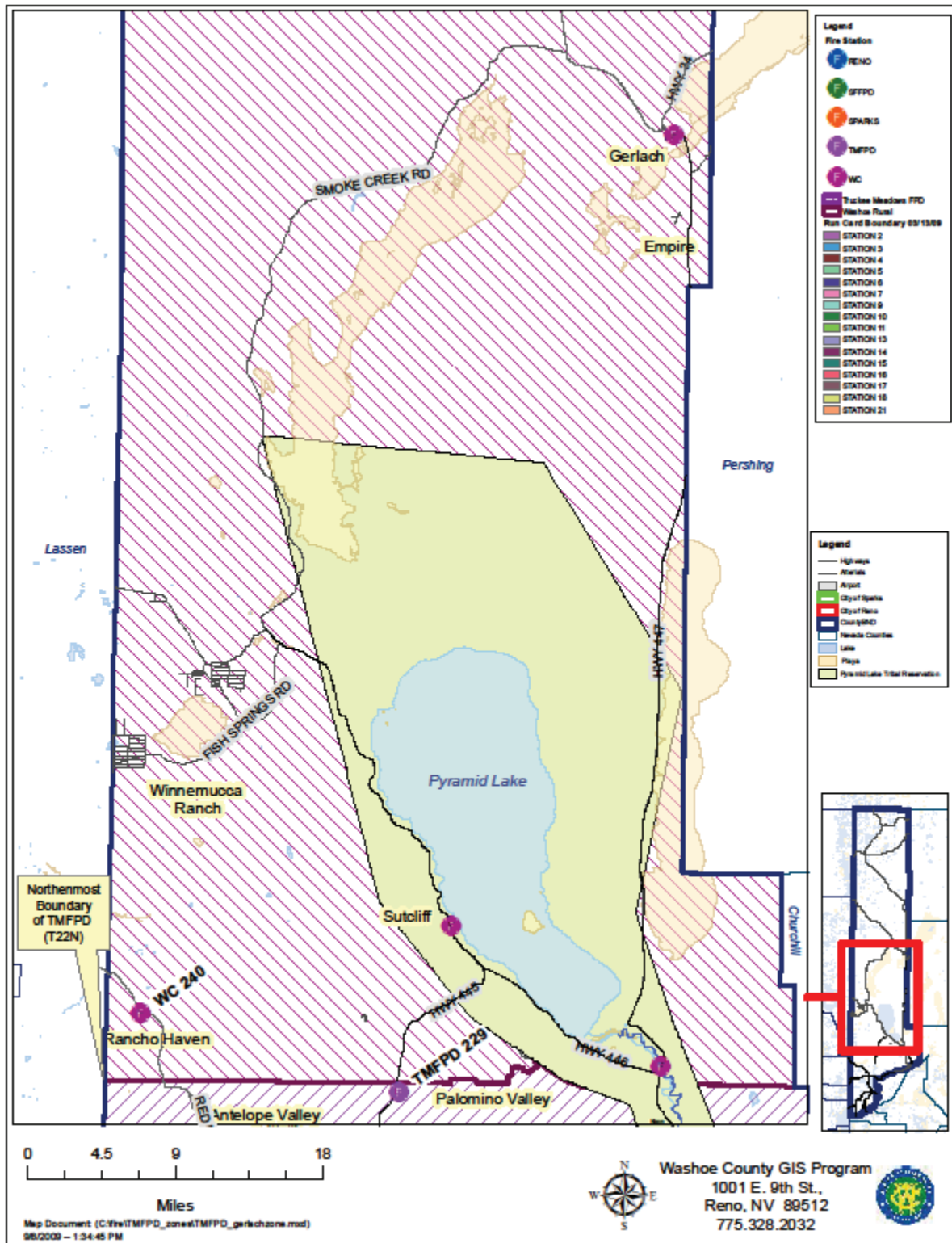
Governance

The Volunteer Fire Departments in the County are separate federal 501-C non-profit corporations or associations and each are governed by their own Board of Directors. The County of Washoe general fund provides funding for medical exams, insurance including workers compensation and liability, fuel, utilities, personal protective equipment, stand and apparatus maintenance, apparatus and equipment.

Washoe County should enter into a contractual relationship with Red Rock and Gerlach Volunteer Fire Departments, during this process they should verify if the federal 501-c3 non profit status is current.







Highways and Other Access

Primary access to Washoe County Volunteer Fire Departments is US Highway 395 dissects the County in a North- South direction. State Routes 445, State Route 447 and State Route 34 are also major roadways for Gerlach, Suttcliffe and Red Rock. Numerous common carriers provide interstate and intrastate service. There are many County maintained roads that traverse the northern areas from the California Communities of Eagleville, Cedarville, and Ft. Bidwell.

Reno/Tahoe International Airport and the Reno/Stead Airport are located within Washoe County. The Truckee River runs through Washoe County and provides recreational opportunities. Union Pacific and Burlington Northern Santa Fe railroads offer cargo service through Washoe County and Amtrak provides passenger service. There is a major East West railroad route that is primary to the Feather River Route and the main alternative to the UP route adjacent to I-80.

Red Rock Volunteer Fire Department **Washoe County Station #240 (Red Rock)**

Red Rock Volunteer Fire Department is an isolated county volunteer fire station approximately 40 miles from Reno. It consists of a small number of volunteer firefighters. This department provides all initial emergency response services to the community and is usually on scene 30 to 40 minutes prior to the arrival of any additional responding agencies, however the daytime responders vary from a few to none depending on the day of the week and time of day. This is mainly a result of being a rural community with no businesses or local employment. The problem with a volunteer force is that availability is sporadic, the level of training is not at the same level of its career counterparts and the call volume is small, resulting in the overall lack of experience. Truckee Meadows Fire Protection District Station 18 backs up the Red Rock Volunteer Fire Department. All Red Rock fire apparatus is serviced and maintained by the County heavy equipment shop.

Water available for the fire suppression is very limited in the Red Rock area. There are no fire hydrants or water storage tanks. Water sources consist of private wells and ponds located in the canyon between Red Rock and Rancho Haven. The round trip time to refill fire apparatus is more than 45 minutes.

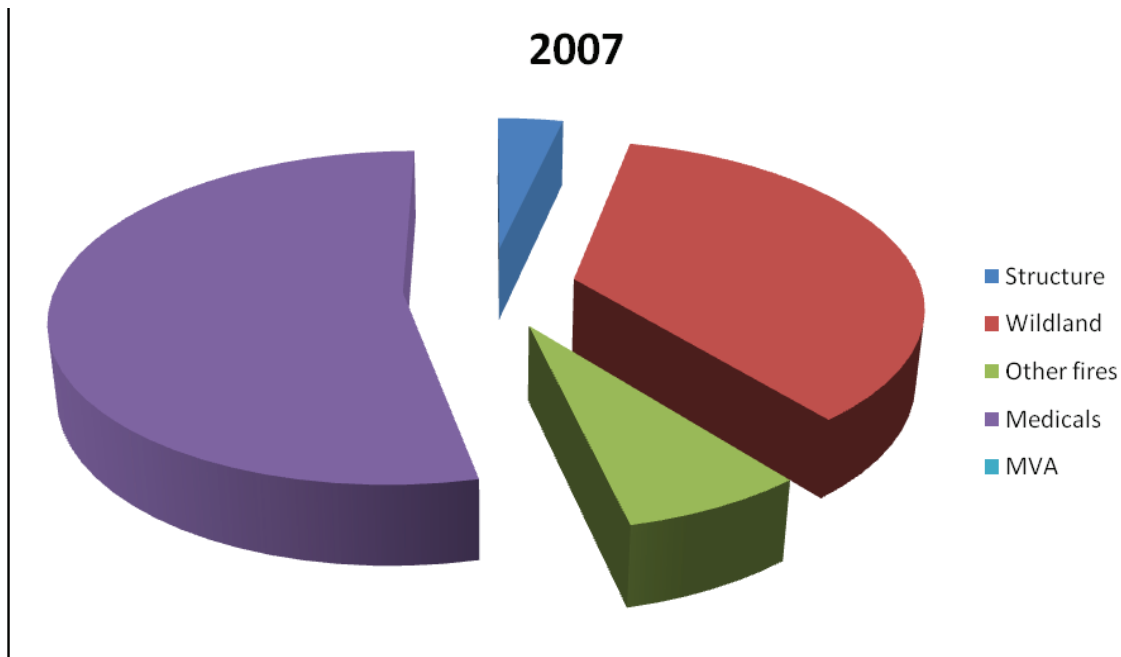
The community of Red Rock is situated in the bottom of the valley along the west and south sides of Fred's Mountain. Slopes in the community range from almost flat to 20% slopes with various aspects. The elevation is approximately 4,900 feet. The prevailing wind direction is from the south and southwest. The fuel is primarily a brush/grass fuel model with some Juniper. Much of the Juniper has been burned in previous fires, but not to the extent to alter fire spread, If any thin it would serve to reduce the fire intensity in those burned areas since there is more of a transition to a grass (Flashy) fuel model. Many fires and lightning-caused ignitions have affected the Red Rock community.

Red Rock Apparatus

Type of Apparatus	Purpose of Apparatus
Type 1 engine	Structure engine-AWD
Type 3 engine	Urban Interface engine
Type 6 engine	Wildland patrol
Squad	4wd vehicle
Water Tender	Portable water source

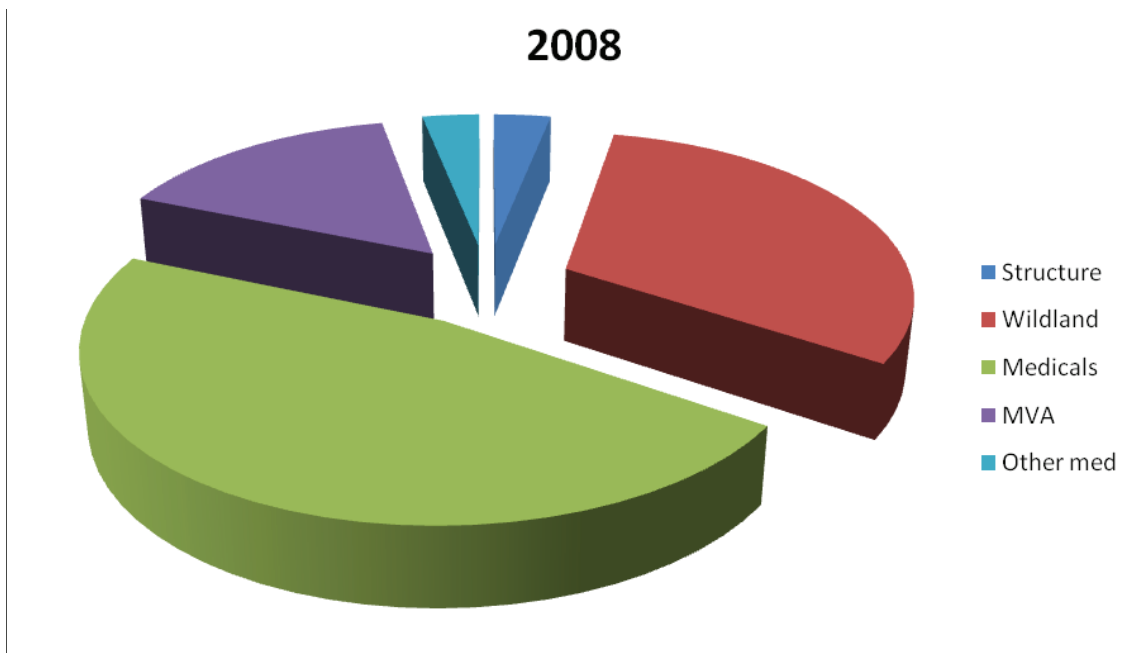
2007 Incidents

Type of Incident	Number of Responses
Structure	1
Wildland	10
Other Fire	2
Medical	15
MVA	2
Others	0
Totals	30



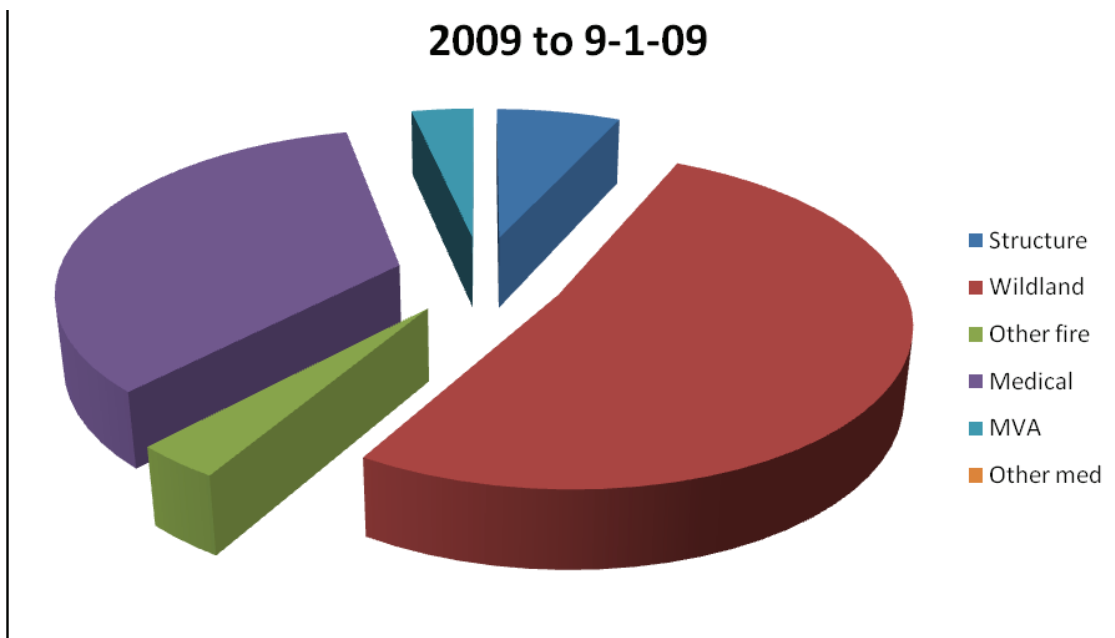
2008 Incidents

Type of Incident	Number of Responses
Structure	2
Wildland	10
Other Fire	2
Medical	15
MVA	5
Others	1
Totals	33



2009 Incidents as of September 1, 2009

Type of Incident	Number of Responses
Structure	2
Wildland	15
Other Fire	1
Medical	10
MVA	2
Others	1
Totals	31



Sutcliffe Volunteer Fire Department

Washoe County Station #241 (Sutcliffe) Sutcliffe Volunteer Fire Department is an isolated county volunteer fire station approximately 40 miles from Reno. It consists of approximately 2 to 3 volunteer firefighters. They have little or no training and will not participate in any regularly scheduled training. The Sutcliffe Volunteer personnel associate closely with the Nixon Volunteer Fire Department because of close tribal ties. Sutcliffe is located at the base of the alluvial fan on the east slope of the Virginia Range. The majority of the fuels within and around the community consists of sagebrush, rabbitbrush, cheatgrass, ricegrass, needlegrass and Sandberg bluegrass. These fuels are very flammable.

The community has a hydrant system with a 500 gallon per minute flow capacity. The community also has a water storage tank of 250,000 gallons that is replenished by a well equipped with an electric pump. Hydrants are located throughout the community and are gravity fed. Pyramid Lake can be used as a drafting and helicopter dip site.

In June of 2009 Washoe County Fire Services Coordinator, Kurt Latipow prepared a Staff Report to the Board of Commissioners that Washoe County enter into a cooperative agreement between the County and the Pyramid Lake Paiute Tribe for the provision of Fire and Emergency Medical Services for the privately held areas of Sutcliffe.

The agreement has the Tribe providing primary fire and emergency medical response to the Sutcliffe area. The fire station in Sutcliffe was owned by the Tribe and was loaned to the area volunteers to provide service. The agreement allows for the station to revert back to the Tribe and the County agreed to provide a surplus Type 1 structure engine and a brush engine for the tribes use and to subsidize the tribe by providing \$1500 a year for maintenance and supplies. The agreement was approved by the Board of Commissioners and implemented in June of 2009.

Gerlach Volunteer Fire Department

Washoe County Station #242. Gerlach Volunteer Fire Department is an isolated county volunteer fire station approximately 110 miles from Reno (approximately 1 hour and 40 minute drive from Gerlach). It is a stand alone volunteer fire department that has just completed an extensive EMS training program. It consists of approximately 8 to 10 volunteer firefighters. They provide not only fire protection services but also a local ambulance service that will transport emergencies to distant hospitals or will be met en-route by ground ambulances or air transportation services. The closest career/paid station is Reno Station 17, located at Spanish Springs which is 100 miles away or approximately 1 hour and 40 minutes travel time. Their fire apparatus and equipment are well maintained by local maintenance in the Washoe County Transportation Yard.

Gerlach has fire hydrants within 1,000 feet of structures with a flow capacity of at least 500 gallons per minute. These hydrants are gravity fed from two water tanks, with a total capacity of 400,000 gallons. The water source is supplied from a natural spring.

The terrain around the community of Gerlach is generally flat with slopes less than eight percent. The prevailing wind direction is from the south and southwest, and high wind speeds are common during

summer afternoons. The vegetation fuels around Gerlach are primarily slatgrass flats interspersed with shrubs that include Bailey's greasewood, rabbitbrush, horsebrush, bud sage, shadescale, cheatgrass and basin wildrye. These fuels are extremely flammable. There are large expanses juniper stands and mountain mahoganies adjacent to the ranch areas.

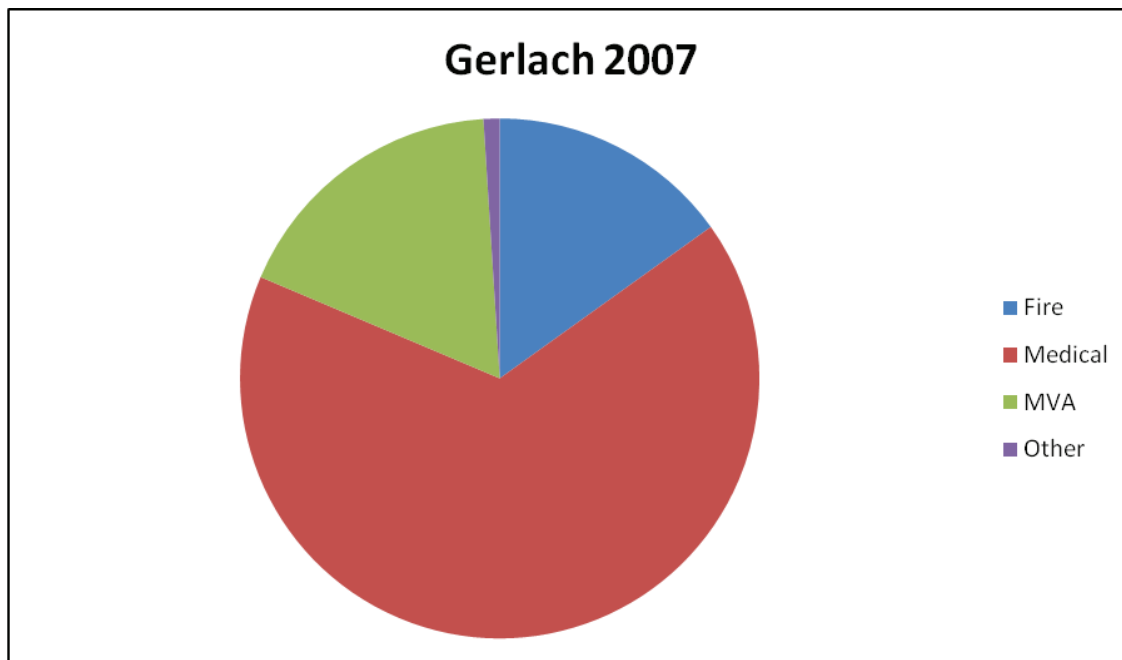
Source: Bill Gooch, Gerlach Volunteer Fire Chief

Available Call History

Gerlach Fire Department Response

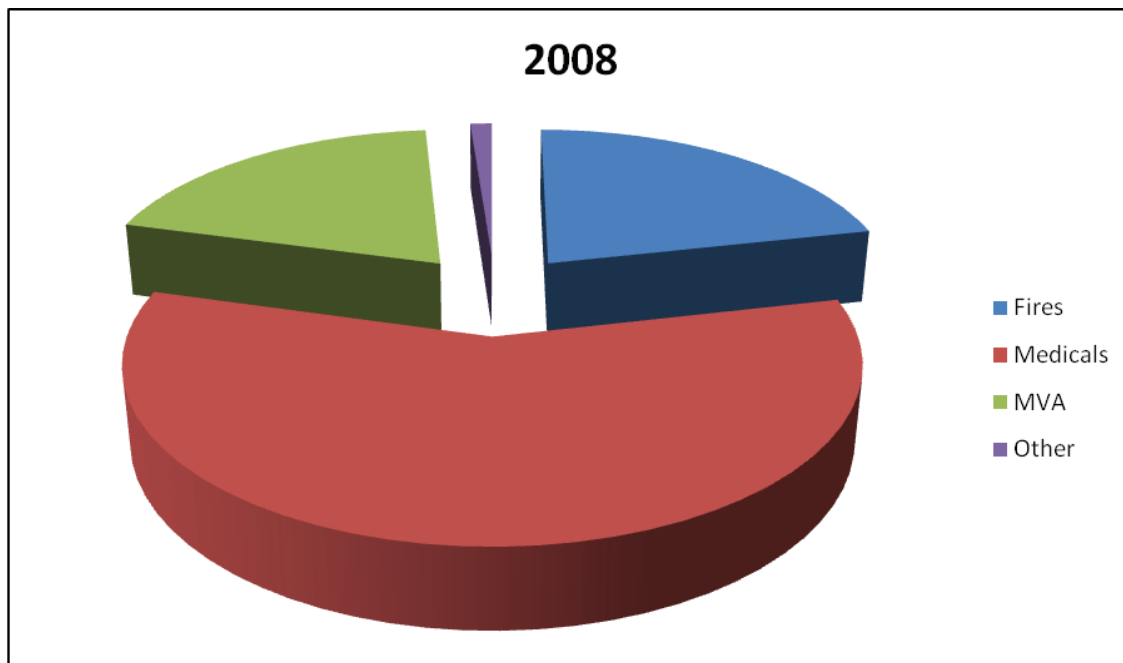
Gerlach 2007 calls

Type of Incident	Number of Response
Fire	18
Medical	79
Motor Vehicle Accident	21
Other Incident	8
Total Calls	126



Gerlach 2008 Calls

Type of Incident	Number of Responses
Fire	22
Medical	59
Motor Vehicle Accident	20
Other Incident	3
Total Calls	104



Gerlach has a large amount of calls compared to their population- A two year average of 114 calls, nearly 1 call every 3 days with a population of approximately 554. Gerlach Volunteer Fire Department could use a part time employee to help with initial response. The lack of good data for a more in depth analysis would indicate that this issue may not be as significant as presented.

Gerlach Fire Apparatus

Type of Apparatus	Purpose of Apparatus
Type 2 engine	Structure engine
Type 3 engine	Urban Interface engine
Type 6 engine	Wildland patrol
Water Tender	Portable water source
Ambulance	Primary response unit
Ambulance	Back up response unit

Emergency Medical Services

The Gerlach VFD provides an ambulance service. The Volunteer staff consist of 8-10 personnel. Of these individuals only a few are trained as EMT Intermediate. A minimum of one EMT-Intermediate crewmember is required to respond the Gerlach Fire Ambulance. The response area for the ambulance can take them to the Oregon border. During the Burning Man event Gerlachs population increases to 60,000 for the one week event. Event organizers give the Gerlach VFD \$1000 to offset the impact to the organization. Burning Man is actually located in Black Rock city which is approximately 14 miles east of Gerlach. The event organizers contract with REMSA to have one ambulance on staff at the center of the event, however outside the core event area, Gerlach is obligated to respond.

Gerlach Fire Department has a goal to have a part time employee to provide staffing for daytime hours in Gerlach. This could assist with staffing of the ambulance, and provide some support for department issues, community education or serve as a point of contact for the public. This is a well thought out goal that would require funding from the County of Washoe.

Fire Prevention

Fire Prevention activities and code enforcement for these areas of Washoe County are provided by a contract through the County and Truckee Meadows Fire Protection District, services are performed by the Reno Fire Department.

Fire Prevention activities such as fire permits, construction plan review and inspections, built-in fire protection systems such as automatic fire sprinkler systems and fire alarm systems, are done within the Fire Prevention Division of the Reno Fire Department.

These inspections include: Residential, Industrial, Commercial, Retail, and other required inspections Washoe County has adopted the 2003 edition of the International Fire Code through action of the Washoe County Board of Commissioners. The 2003 IFC is found in Chapter 60 of the Washoe County Code.

The adoptions of the IFC and can be viewed on the County's website at: http://www.co.washoe.nv.us/clerks/files/pdfs/county_code/Chapter060.pdf

The IFC is printed by the International Code Council (ICC). The International Code Council, a membership association dedicated to building safety and fire prevention, develops the codes used to

construct residential and commercial buildings, including homes and schools.

In addition to the IFC, the fire departments are regulated by the Nevada Administrative Code (NAC), Chapter 477- State Fire Marshal. The NAC 477 is adopted by the Nevada Legislature and all Nevada fire agencies are regulated by this law. NAC 477 covers specific fire prevention requirements of the State Fire Marshal and the SFM's office. NAC 477 regulates the following fire prevention activities: LICENSES AND CERTIFICATES OF REGISTRATION, FIRE SYSTEMS, PORTABLE FIRE EXTINGUISHERS AND FIXED FIRE EXTINGUISHING SYSTEMS, PORTABLE BUILDINGS, AUTOMATIC SPRINKLER SYSTEMS, INSTITUTIONAL BUILDINGS, CHILD CARE FACILITIES, FIREWORKS, CONTAINERS FOR FLAMMABLE OR COMBUSTIBLE LIQUIDS, USE OF EXPLOSIVES IN BLASTING, REVIEW OF PLANS, TYPE 1 EXHAUST SYSTEMS, FIRE STANDPIPE SYSTEMS, and MISCELLANEOUS REQUIREMENTS. This document is attached as an appendix to this report.

The Gerlach Fire Department offers public education programs, fire safety programs, as requested. Other fire agencies do the same.

The sale and use of any fireworks within Washoe County is prohibited.

Investigations of fire and other related incidents are conducted by Staff of the Reno Fire Department. There are times when they also use the Nevada State Fire Marshal's Office in an investigation. 28 fire investigations were conducted County wide by Reno Fire in 2008. There was a reported fire loss in 2008 for unincorporated areas of the County covered under the Reno contract of \$2,847.00.

The use of Fire Prevention Assistance from the Reno Fire Department is a cost effective way to maintain professional expertise and not burden the volunteer fire departments with activities they would rarely perform

Communications

Reno and Washoe primary 911 PSAP and emergency communications facility identified as ECOMM is located on the grounds of Washoe County's Regional Public Safety Training Center campus located north of Reno, east of US-395N at 5195 Spectrum Blvd, Reno NV.

This new campus and adjacent facilities were constructed in early 2000. The ECOMM 911/Dispatch Center became operational in 2003. ECOMM is located within a 2 story building that houses the Washoe County Emergency Operations Center on the 1st floor with the ECOMM Regional 911 Dispatch Center and related administrative offices on the 2nd floor.

The Dispatch Center appears to be fully NFPA1221 compliant with generator and UPS backup. In addition, the facility appears to be built to Essential Services Seismic Requirements although no specific engineering data was provided for this analysis. With an external radio tower, the grounding system appears to be adequate, but should be fully examined to determine if the R56 Grounding Standard has been met to protect the facility from transient grounding issues or lightning strikes. The 911 Dispatch Center's security is closely monitored by a closed circuit security system with an electronic gate and door access control. The facility co-exists on the 120 acre campus of the Regional Public Safety Training Center. The RPSTC operates under an inter-local agreement between most of the public safety agencies in Washoe County and the Truckee Meadows Community College District.

The Washoe 911 Center is the primary Pubic Safety Answering Point (PSAP) and 911 Dispatch Center for

8 agencies in the greater Washoe County area. Those agencies include :

- Reno Police Department
- Reno Fire Department(Includes Truckee Meadows FPD)
- Washoe County Sheriff's Department
- Washoe County Search and Rescue
- University of Nevada Police Department
- Truckee Meadows Community College Police department
- City or Reno Marshal's Office
- Sierra Fire Protection District

However, Incline Village and the surrounding areas are dispatched from an independent dispatch center managed by the Washoe County Sheriff's Office utilizing the Washoe County Sheriff's Incline Substation as its facility. The Incline PSAP/911 Center also dispatched all fire and EMS 1st responder and ambulance transport services (fire based, not REMSA) for the North Lake Tahoe Fire District (Incline and adjacent areas).

Although the Incline area 911 Dispatch Center is an independent operation under the direct control of the Washoe County Sheriff's Department, they are technically linked with the ECOMM network for utilization of the Tiburon CAD functionally.

The City of Sparks also operates a separate 911 PSAP dispatch center for the Sparks Police and Fire Department. However, unlike the Sheriff's Incline Dispatch Center, Sparks relies on REMSA (Reno Emergency Medical Services Authority) to initiate pre-arrival EMS instructions and EMS transport services.

The primary ECOMM is a regionally based operation that is housed in a Washoe County leased facility. However the 911 center is under the jurisdiction of the City of Reno (Technology Department) for its day-to-day functions and operations. The 911 Center is staffed by the City of Reno employees (dispatchers), and is under the direction of a Center Manger (position currently vacant although temporarily filled internally) who reports to the City of Reno's Communications & Technology Director, Mr. Rick Vandenberg. Although managed by the City of Reno, various user groups and operations committee in the Washoe area provide input to the dispatch operation ether directly or indirectly through staff representation. Individual agency operational change requests are generally coordinated directly with the Washoe Dispatch Center Manager or assigned staff.

ECOMM provided incident call activity for the year 2008 includes:

- Fire & EMS = 30,895 = 14% of total calls
- Law enforcement related= 184,014 = 86% of total calls
- 911 Calls Received= 59,405
- 911 wireless calls received = 101,120

The Reno Information Technology Department maintains most all the technology features of the 911 Dispatch Center through its own internal staff or external contract support. The Computer Aided Dispatch system (CAD) is manufactured by Tiburon Pubic Safety Software Solutions in Pleasanton, California. The CAD system is a robust law enforcement/fire based system that continues to evolve as the needs of the Washoe County area grows. Even though the Incline area is dispatched separately utilizing an independent facility located in Incline Village, the Tiburon CAD is linked to the Incline location for utilization of the centralized geo-file, run-database and CAD functionally.

The Tiburon CAD is a fully automated system that includes various interfaces to external devices such as;

- Push to talk radio ID (via 800MHz)
- Mobile Data Terminals (although not fully deployed regionally)
- Paging and fire station alerting
- E911 call transfer
- CAD Records Management (AKA Tiburon Mobile Reports)
- TDD/TTY
- AVL (although not fully utilized)
- Zetron (fire alerting via conventional fire pagers)
- Geofile

Volunteers are dispatched from the Regional Washoe/Reno 911 PSAP dispatch center. The methods used are VHF tone pagers, alpha pagers and 800 MHZ radios. As a part of Gerlach VFD communications equipment their resources include 2 satellite cell phones which also become helpful when trying to contact the Dispatch Center in remote area. These use of pagers and satellite cell phones is a prudent decision for remote areas

Mutual Aid

Mutual Aid within the Washoe County Volunteer Fire Departments is critical. The great distance between fire apparatus, the availability of firefighters and command staff makes any fire or medical emergency within the region a significant event. The volunteer fire departments are truly necessary for the communities they serve. Large scale wildfires pose the greatest risk to these communities. Washoe County has a large amount of resources available to fire agencies, but the real question is can they arrive in a timely manner.

The Mutual Aid system requires that the following questions be answered:

- Type of equipment requested- structural engine, brush truck, aerial truck, etc.
- When is the equipment needed-immediately, planned need, stand-by, etc.
- Where is the equipment needed-to the scene, at a staging area, to a specific station for coverage, etc.
- Phone number for agency requesting assistance.
- Radio frequency assignment designated by the requesting agency.

Fire Apparatus within the County of Washoe Provided by all Career and Volunteer Fire Departments

<i>Types of Apparatus</i>	<i>Estimated Numbers of Apparatus</i>
<i>Type 1 Engines (Structure)</i>	<i>74</i>
<i>Aerial Ladder Trucks</i>	<i>6</i>
<i>Brush Engines (Wildland)</i>	<i>29</i>
<i>Water Tenders</i>	<i>10</i>

During the summer months and in the wild land areas, the Nevada Division of Forestry, and the Bureau of Land Management provide hand crews, dozers, aircraft, engines, etc. However because of the priority system in place, and because Northern Washoe County is so extremely rural, resources are often not immediately sent, often because of the limited availability during high volume and activity periods. When resources are sent, generally aircraft are first on the scene. Minden, Nevada is the dispatch point for BLM resources.

There is no state agency jurisdictional responsibility in this area and no existing mutual aid agreement. The only agreements are with Sierra Fire, BLM, and Reno. There are no other mutual aid agreements accessible to Washoe County all other is assistance for hire

The most probable need for mutual aid would be a large Wildland fire. Each volunteer fire department has responded initially to the event that would ultimately become the responsibility of a Federal or State Agency

Major Risk Scenarios

Special Challenges for the Fire and Life Safety System facing the Washoe County Volunteer Fire Departments

Flood Hazard

Causes of Flooding

Flooding occurs when climate (or weather patterns), geology and hydrology combine to create conditions where river and stream waters flow outside of their normal course and “overspill” beyond their banks. In Washoe County, the combination of these and other factors, create chronic seasonal flooding conditions. Flooding is most common December through March in Washoe County when storms encompassed with warmer temperatures and heavy rainfall come over the snow-packed Sierra Nevada mountains. Larger floods result from the heavier rains that continue over the course of several days, incorporated with by snowmelt at a time when the soil is near saturation from previous precipitation. Riverine flooding and urban flooding are the two types of flooding that primarily affect Washoe County. Riverine flooding is the overbank flooding of rivers and streams, the natural process of which adds sediments and nutrients to fertile floodplain areas. Urban flooding results from the conversion of land from fields or vacant land to buildings, parking lots and roads, though which the land loses its ability to absorb rainfall and the water runoff from the storms causes increased water in the low-lying areas. In the areas of the Washoe County Volunteer Fire departments there are no flooding hazards associated with these mechanisms. All creeks in the area are prone to flash flooding due to excessive rainfall. Snow melt is not an issue, there are no rivers or watercourses that are much more than small creeks or seasonal washes.

Reference

Washoe County Website- Flood Awareness

Water Rescue Scenarios

Water rescues can be particularly dangerous for rescuers. Conditions that can affect water rescue operations include volume and velocity of water, floating debris, unusual drop-offs, water depth and hydraulic effects, as well as dangers that may be hidden below the surface that can result in rescuers becoming trapped in rocks or other debris, or being cut by glass, metal and other items on the river bed.

Swift water situations can carry a person away quickly, and often the temperature of the water will quickly lead to hypothermia that can incapacitate anyone who ventures into or falls into the Truckee River. Hypothermia occurs when the body's core temperature is dramatically lowered. Among other results, there is a loss of strength and muscular coordination as well as mental confusion and often erratic behavior that can all combine to overcome the victim's swimming skills, and ultimately lead to drowning.

Washoe County Volunteer Fire Departments do not have the water rescue scenarios that have been outlined above. There are only small reservoirs and lakes that have stream fishing as do the small creeks.

Water Rescue Operations for Washoe County are provided by the Washoe County Sheriff's Department Hasty Team

Earthquakes

The Reno-Carson City urban corridor is the second most populated region in Nevada, and lies in one of the most seismically active parts of the State. There are at least 30 faults that could cause damage in the Reno-Carson City urban corridor. The probability of at least one magnitude 6 or greater event in the next fifty years is between 34 and 98%. The probability of at least one magnitude 7 or greater event in the next fifty years is between 4 and 50%. Hazards include intense ground shaking, ruptures of the ground, liquefaction, landslides, and ancillary problems, such as fires and hazardous waste spills.

Source- Nevada Bureau of Mines and Geology

Washoe County Volunteer Fire Departments would rely on the Reno/Truckee Meadows Fire Departments Urban Search and Rescue teams for assistance when and if they area available

Hazardous Materials

The transportation and storage of hazardous materials is clearly a regional issue. A large quantity of hazardous products are transported on highways and railways where the potential for release of this material into the environment represents a potentially significant public health risk.

Washoe County Volunteer Fire Departments will rely on the County Wide Hazardous Materials Response Team

Wildland Fire and fires in the Wildland/Urban Interface

Wildland/urban interface refers to the geographical areas where formerly “urban structures—mainly residences—are built in close proximity to the flammable fuels naturally found in wildland areas, including forests, prairies, hillsides and valleys. The results can be aesthetically desirable...or disastrous”

As urban areas expand into wildland areas and as an increasing number of homes are built near wildland areas, the conflicts associated with wildland fire become more commonplace. Just as wildland fires threaten people and their property, human caused fires threaten wildlands. Thus homeowners and developers benefit by knowing the risks and protection strategies related to home development in wildlands.

A dream home built in an idealistic wildland setting can be razed by fire in a matter of minutes. Likewise, the exemplary scenery that attracted homeowners to the setting can be altered, often because of the inadvertent action of the homeowner.

Washoe County Volunteer Fire Departments will rely on the extensive mutual aid system to deal with a catastrophic Wildland fire.

Eight Components of Standards of Cover Systems

The Standards of Cover systems approach consists of the following eight components:

- Existing deployment
- Risk identification
- Risk expectations
- Service level objectives
- Distribution
- Concentration
- Performance and reliability
- Overall evaluation

Existing Deployment Policies

All agencies have an existing policy, even if it is undocumented or adopted by the locally responsible elected officials. Originally, stations and equipment were located to achieve certain expectations. How and why they were sited needs to be historically understood, described and contrasted to proposed changes.

Table for Assessing Land Use Against Response Needs

Land Use Category	Definition	Use Rate & Risk Factors	Travel Time	Concentration	Effective Response Force
Single Family Residential	Single family dwellings Small lot less than one acre	High use for medical aids Low frequency of fire 24-hour a day problem	4 minutes 59 seconds or under 5 minutes 90% of the time	7 minutes 59 seconds or under 8 minutes	Minimum of 13 personnel within 10 minutes
Multi-family Dwellings	Under 10 Apts/Units	Same as Residential			
	11 to 25 Apts/Units	Same as Residential			
	Over 25 Apts/Units	Somewhat higher than residential			Minimum of 15 personnel within 10 minutes
Planned/Centralized Commercial (non-assembly)	Under 5,000 sq ft	Low for EMS Moderate for Fire	3 minutes 49 seconds 90% of the time	7 minutes 59 seconds or under 8 minutes	Minimum of 15 personnel within 10 minutes
	5,000 to 20,000 Square Feet	Very low for EMS High for fire impact			Minimum of 15 personnel within 10 Minutes
	Over 20,000 Square Feet	Very low for EMS Major loss potential for fire			Minimum of 21 personnel within 12 Minutes
Public Assembly	Under 50 Occupants	Low frequency Moderate impact	3 minutes 49 seconds 90% of the time	7 minutes 59 seconds or under 8 minutes	Minimum of 15 personnel within 10 minutes
	Over 50	Very low frequency Very high impact	3 minutes 49 seconds 90% of the time	7 minutes 59 seconds or under 8 minutes	Minimum of 21 personnel within 12 Minutes

Land Use Category	Definition	Use Rate & Risk Factors	Travel Time	Concentration	Effective Response Force
Industrial	1,000 gpm or less	Industrial EMS High loss ratio	Level of Acceptable Risk		Minimum of 17 personnel
	1,001 to 3500 gpm	Industrial EMS Moderate loss ratio			Minimum of 21 personnel
	3,501 to 5,000 gpm	Industrial EMS Very high loss ratio			Minimum of 24 personnel
Single Family (large lots)	Lot sizes 2 to 5 acres	EMS priority Fire moderate	6 minutes 59 seconds 90% of the time	10 Minutes	Minimum of 15 personnel within 10 minutes
Rural Development	Lot sizes over 5 acres	EMS priority Fire is infrequent occurrence	20 minutes	30 minutes	None Designated?
Wildland Area	No subdivided parcels Size expressed in square acres or square miles	Rescue issues Containment of ground fuels	30 minutes	1 Hour	None Designated

The table is a description of Published Standards for Emergency Response as defined by a variety of resources, including the National Fire Protection Association, the Insurance Services Office, the Center for Public Safety Excellence, etc.

National Standards for Volunteer Fire Departments

NFPA 1720, Standard for the Organization and Deployment of Fire Suppression, Emergency Medical Operations, and Special Operations to the Public by Volunteer Departments is the standard that was used to evaluate the Washoe County Volunteer Fire Departments Capabilities. These minimum criteria are aimed at effectiveness and efficiency. Effectiveness refers to the manner in which things are done: meeting an objective fully and correctly the first time. This implies that it may require more resources and take more time than expected, but the objective is fully satisfied and does not require revisiting. Efficiency is really an economic term referring to accomplishing an objective at the lowest cost. Cost is a function of resources, direct financial cost, and time. Effectiveness and cost are not always compatible.

The NFPA 1720 standard does not address fire prevention, community education, fire investigations, support services, personnel management, and budgeting for volunteer fire departments.

NFPA 1720 applies to volunteers who typically don't have personnel on-duty in stations and instead respond to page-out from home, work, or elsewhere. It is this fact of volunteer response that introduces a key variable into the picture. Volunteers cannot guarantee availability like career, on-duty staff can do unless the volunteers are in the station when actually alerted. In this standard response goal criteria are very different and intended to reflect the nature of a volunteer response system.

In general, 1720 provides the following benchmarks:

- **Urban Zones** with >1000 people/sq. mi. call for 15 staff to assemble an attack in 9 minutes, 90% of the time.
- **Suburban Zones** with 500-1000 people/sq. mi. call for 10 staff to assemble an attack in 10 minutes, 80% of the time.
- **Rural Zones** with <500 people/sq. mi. call for 6 staff to assemble an attack in 14 minutes, 80% of the time.
- **Remote Zones** with a travel distance =8 mi. call for 4 staff, once on scene, to assemble an attack in 2 minutes, 90% of the time.

It is doubtful that Washoe County Volunteer Fire Agencies can meet the staffing requirements of 4 personnel and then have the ability to assemble an attack in 2 minutes of arrival

There is a direct relationship between fire development, temperature, and time. Intervention is the strategy, whether it is through the use of automatic fire sprinklers or firefighters. Community resources dictate fire service capacity. The larger the town, the more fire stations may be needed. Having fire stations implies staff and equipment. Staffing presents an option, to a point volunteers are less expensive than paid staff, however the savings in personnel costs may translate into a higher community-wide fire loss. The distribution of fire companies (stations) is important and ISO looks for the built-upon area of a community to have a first-due engine company within 1.5 road miles of its assigned district and a ladder-service company within 2.5 road miles.

Using a formula developed by the RAND Corporation (**Expected Travel Time = 0.65 + 1.7 Distance Traveled**), ISO set a benchmark criteria of an expected response time of 3.2 minutes for an engine company and 4.9 minutes for a ladder-service company in a defined standard response district. The formula has been validated on numerous occasions and yields an average speed of 35 MPH for a fire apparatus responding with emergency lights and siren (considering average terrain, average traffic, weather, and slowing down for intersections). The NFPA uses this formula in the 1142 standard.

ISO determines standard response districts (SRD) for each existing fire station. An SRD for an engine company is a polygon defined by streets leading from the fire station out to a distance of 1.5 road miles. For a ladder-service company, the standard response district is a polygon defined by streets out to a distance of 2.5 road miles. The ISO then considers the number of fire hydrants within the SRD. (When fire hydrants are not available they measure the total linear road miles in the standard response district.) Thus, the presence of hydrants signifies a built-up area. They then identify contiguous built-upon areas in the community that do not have a fire station within the specified distance. If such an area has at least 50 percent of the number of fire hydrants (or, in areas without hydrants, 50 percent of the linear road miles) found in the SRD, they consider that the area may need a fire station.

The SRD in cities with multiple engine company locations is the average number of hydrants served by the existing engine companies as determined by the total of hydrants within 1-1/2 mile areas divided by the number of engine company locations. Consideration may be given for excluding relatively low number hydrant stations as described below. (from ISO's mitigation website) (Note: This is only a cursory review of this subject as it applies to ISO's rating schedule criteria for response and station location.)

In addition, the ISO provides exceptions to their response area coverage criteria for cities and towns lacking a hydrant system or only having partial hydrant coverage. The exceptions vary by state and are sometimes referred to as the suburban rule.

Summary of the ISO's Suburban Rule Exceptions:

- Properties 5 road miles or less to a responding fire station and with a hydrant within 1,000 feet are classified as being within the hydrant area. Thus, these properties receive better public protection classifications.
- Properties 5 road miles or less to a responding fire station and with a hydrant more than 1,000 feet away are classified as protected, but outside the hydrant system. These properties receive a lower public protection classification
- Properties more than 5 road miles to a responding fire station receive the poorest public protection classification, essentially being without unrecognized protection. These properties receive the absolute lowest public protection classification.

Note: The public protection classification (or PPC) scale is 1 – 10, with 1 being the best.

Description of Published Standards

National Standard for Comparison	Organization
Minimum effective company staffing is 4 firefighters	Dallas FD Study, Seattle FD Study, NFPA Standards, Federal OSHA
Engine co. within 1.5 miles of built upon areas	Insurance Services Office (ISO)
Ladder truck within 2.5 miles of built upon areas	Insurance Services Office (ISO)
Staffed ladder truck should be available if 5 or more buildings exceed 35' in height or fire flow exceeds 3500 gpm.	Insurance Services Office (ISO)
Average fire-ground staffing to be 15 firefighters for moderate risk fires (single family residential) and up to 53 for high risk fires (industrial, high risk unprotected residential, etc.) <i>Called Critical Tasking</i>	Center for Public Safety Excellence, Commission on Fire Accreditation International
National average of on-duty personnel = .48 per 1,000 population	International City/County Management Association (ICMA)
National average total uniformed personnel = 1.59 per 1,000	International City/County Management Association (ICMA)
Arrive at structure fire prior to flashover (typically 5 to 7 minutes from ignition)	FEMA National Fire Academy
Arrive at EMS call within 4 to 6 minutes of cardiac or respiratory arrest	American Red Cross

Reference

Description of Fire service Deployment Assets

March 2008

Evaluation of Washoe County Volunteer Fire Departments

National Standard for Comparison	Washoe County Volunteer Fire Departments
Minimum effective company staffing is 4 firefighters	Rarely can meet this Standard
Engine co. within 1.5 miles of built upon areas	Generally can meet this Standard
Ladder truck within 2.5 miles of built upon areas	<i>Does not meet this standard</i>
Staffed ladder truck should be available if 5 or more buildings exceed 35' in height or fire flow exceeds 3500 gpm.	<i>Structures generally do not dictate this Standard</i>
Average fire-ground staffing to be 15 firefighters for moderate risk fires (single family residential) and up to 53 for high risk fires (industrial, high risk unprotected residential, etc.) <i>Called Critical Tasking</i>	<i>Unable to meet this Standard</i>
National average of on-duty personnel = .48 per 1,000 population	<i>Unable to determine, this is a career Standard and fire stations are not staffed 24/7</i>
National average total uniformed personnel = 1.59 per 1,000	<i>Unable to determine, this is a career Standard and fire stations are not staffed 24/7</i>
Arrive at structure fire prior to flashover (typically 5 to 7 minutes from ignition)	<i>Unable to meet this Standard</i>
Arrive at EMS call within 4 to 6 minutes of cardiac or respiratory arrest	<i>Occasionally this occurs, but this is a difficult standard to evaluate do to volunteer staffing patterns and unpredictable events.</i>

Building Risk Identification and Assessment

Building Risk Identification and Assessment consists of three **elements**:

- **Fire Flow:** The amount of water to control the emergency, which is based on structure, contents and exposures, *and*
- **Probability:** The likelihood that a particular event will occur within a given period of time. An event that occurs daily is highly probable. An event that occurs only once in a century is very unlikely. Probability then is an estimate that an event will occur and a prediction that it will be very close by in time, or sometime off in the future, *and*
- **Consequence:** There are two components - Life Safety (the amount of emergency personnel and equipment to rescue or protect the lives of an occupant from life threatening situations); and Economic Impact (the losses of property, income or irreplaceable assets).

Building Risk Assessment is performed at three levels of measure:

- **Occupancy Risk:** defined as an assessment of the relative risk to life and property resulting in a fire inherent in a specific occupancy or in a generic occupancy class.
- **Demand Zones:** defined as an area used to define or limit the management of a risk situation. A Demand Zone can be a single building, or a group of buildings. It is usually defined with geographical boundaries and can also be called fire management areas or fire management zones. Sometimes Demand Zones are in a department's data reporting areas from which historical workload can be defined, or DZ's could be a Planning Department data area that could be used to identify and quantify risks with the area. The size of the Gerlach, Red Rock and Sutcliffe Volunteer Fire Departments are small, so each agency will be its own Demand Zone.
- **Community:** defined as the overall profile of the community based on the unique mixture of individual occupancy risks, Demand Zone risk levels and the level of service provided to mitigate those risk levels.

EMS and specialty incident response risk assessment and outcome expectations should also be performed using the criteria from those disciplines. For example, an EMS risk category could be trauma patients, with an expectation to stabilize and transport trauma patients to a designated trauma center within one hour of the accident occurring.

Risk Expectations

After we know what the risks are in a community, what do we expect to do about them? Respond to emergencies in them? Deliver prevention and education programs to minimize these risks? Before we set response expectations, the system should outline what it is doing and could additionally do, to control risks. For those risks that cannot be controlled to a level below that requiring a response, we then set outcome expectations for emergency response.

Service Level Expectations

After understanding the risks present in the community, what control measures do the citizens and elected officials expect? For example, does the agency confine the fire to the compartment of origin, area of origin, floor of origin, or building of origin? Some agencies in sparsely populated areas with long response times like 30 minutes or more might have to accept (not like) an exposure level of service where the building fire does not spread to the adjoining forest and start a conflagration. In EMS we might expect to get a trauma patient to the designated trauma center within the first hour. Each risk category found in a community should have an outcome expectation developed for it. Risks other than structure fires are typically EMS, special rescue like confined space, hazardous materials, airports and airplanes, etc.

Washoe County Volunteer Fire Departments have addressed service level expectations by establishing and maintaining a fire department in the remote areas of Washoe County. Gerlach has addressed the priority of medical response with its ambulances and agreements with REMSA to meet the Gerlach ambulance half way during some ambulance transports.

EVALUATING FIRE SUPPRESSION CAPABILITIES

Firefighters encounter a wide variety of conditions at each fire. Some fires will be at an early stage and others may have already spread throughout the building. This variation in conditions complicates attempts to compare fire department capability. A common reference point must be used so that the comparisons are made under equal conditions. In the area of fire suppression, service-level objectives are intended to prevent the flashover point, a particular point of a fire's growth that makes a significant shift in its threat to life and property. Fire suppression tasks required at a typical fire scene can vary a great deal. What fire companies must do, simultaneously and quickly, if they are to save lives and limit property damage, is to arrive within a short period of time with adequate resources to do the job. Matching the arrival of resources within a specific time period is the objective of developing a comprehensive Standards of Cover integrated risk management plan.

The Stages of Fire Growth

Virtually all structure fires progress through a series of identifiable stages.

Stage 1: The Ignition Stage—The ignition of a fuel source takes place. Ignition may be caused by any number of factors, from natural occurrences such as lightning to premeditated arson.

Stage 2: The Flame Stage—The fuel initially ignited is consumed. If the fire is not terminated in this stage, the fire will progress to the smoldering stage or go directly to flashover.

Stage 3: The Smoldering Stage—The fuel continues to heat until enough heat is generated for actual flames to become visible. It is during this stage that large volumes of smoke are produced and most fire deaths occur. Temperatures rise throughout this stage to over 1,000 degrees Fahrenheit in confined spaces, creating the hazard of "backdraft" or smoke explosion. This stage can vary in time from a few minutes to several hours. When sufficient oxygen is present, the fire will progress to the free-burning phase.

Stage 4: Free Burning or "Flashover" Stage—The fire becomes free burning and continues to burn until the fire has consumed all contents of the room of fire origin, including furnishings, wall and floor coverings, and other combustible contents. Research into the flashover phenomenon has yielded criteria that precisely measure when flashover occurs; however, any exact scientific measurement in the field is extremely difficult. Observable events that would indicate a flashover are "total room involvement" and "free burning." These indicators are easily observable by firefighting personnel and the public and can be easily recorded and retrieved for future evaluation. Both scientific tests and field observations have shown when flashover is experienced, it has a direct impact on fire protection and the ability of the emergency services system.

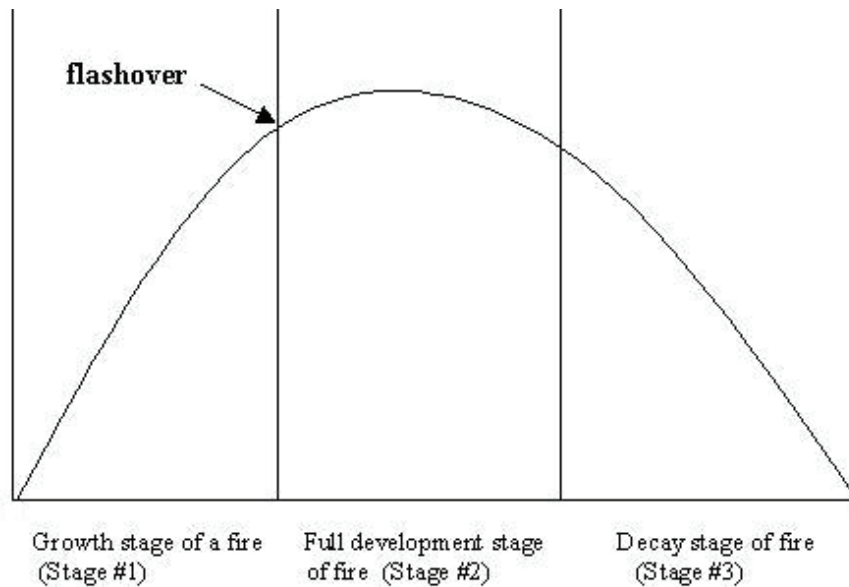
- a. Flashover occurs at a temperature between 1,000 and 1,200 degrees Fahrenheit. These

temperatures are well above the ignition points of all common combustibles in residences, businesses, and industries. When this temperature range is reached, all combustibles are immediately ignited. Human survival after this point is highly improbable without specialized protective equipment.

- b. At the point of flashover, lethal fire gases (carbon monoxide, hydrogen sulfide, cyanide) increase explosively. People exposed to these gases, even when not directly exposed to the fire, have drastically reduced chances of survival.
- c. Flashover can occur within a relatively short period of time. Precisely controlled scientific tests indicate that flashover can occur in as little as two minutes from the flame stage. On the other hand, field observations of actual fires indicate that total room involvement can take as long as 20 minutes or more. There is no way to ascertain the time to flashover since it is not possible to determine when a fire started. Nevertheless, a correlation can be drawn between flashover and the entire fire protection system. As suggested previously, the number of times that fires are controlled before flashover depends on the entire fire protection system and is not solely dependent on emergency response forces. Built-in fire protection, public education, extinguishment by citizens, and even the type of fuel on fire are all factors that affect flashover. Even when fires are not extinguished by firefighting forces, these personnel often provide other services, ranging from smoke removal to the restoration of built-in fire control systems. The objective is all components of the fire protection system, from public education to built-in fire protection to manual fire suppression, are maintained at a level to provide adequate service and the performance of each is periodically evaluated. Flashover is a critical stage of fire growth, as it creates a quantum jump in the rate of combustion and a significantly greater amount of water is needed to reduce the burning material below its ignition temperature. A fire that has reached flashover often indicates it is too late to save anyone in the room of origin, and a greater number of firefighters are required to handle the larger hose streams needed to extinguish the fire. A post-flashover fire burns hotter and moves faster, compounding the search-and-rescue problems in the remainder of the structure at the same time more firefighters are needed for fire attack.

The Significance of Flashover

<i>Limited to one room</i>	<i>May spread beyond one room</i>
<i>Requires smaller attack line</i>	<i>Requires larger, more attack lines</i>
<i>Search and rescue is easier</i>	<i>Compounds search and rescue</i>
<i>Initial assignment can handle</i>	<i>Requires additional fire companies</i>



Flashover Time-Temperature Curve

Flashover Time-Temperature Curve

Staffing and equipment needs can be reasonably predicted for different risk levels and fire stages. The correlation of staffing and equipment needs with fires according to their stage of growth is the basis for response coverage. The goal is to maintain and strategically locate enough firefighters and equipment so a minimum acceptable response force can reach a reasonable number of fire scenes before flashover and intercede in critical medical emergencies. To minimize risk, the department strives to extinguish small fires quickly before they reach flashover potential to minimize risk and to mitigate medical emergencies quickly to reduce cardiac death. As flashover is such a significant fire event, preventing this stage of fire behavior is imperative. Time is a key factor in this effort. Once flashover potential is reached, an exponential increase occurs not only in the rate of combustion, but in the amount of resources necessary to mitigate the fire emergency.

The Washoe County Board of County Commissioners has already established a Service Level Objective with the creation of the Washoe County Established Fire and EMS Response Times. The Chart below outlines those response goals.

Washoe County Established Fire and EMS Response Times*
May 2007

General Rural	Fire- EMS Response	20 + Minute Response Time
Rural Lands	Fire- EMS Response	10-20 Minute Response Time
Suburban Lands	Fire- EMS Response	5-10 Minute Response Time
Urban Lands	Fire –EMS Response	5 Minute Response Time

*Response time is measured from the time the initial call is received until the arrival of the first emergency vehicle

Source: Washoe County Comprehensive Plan, Land Use/Transportation Element, May 2007

Washoe County Volunteer Fire Agencies meet the 20 + minute response criteria as established by the Board of County Commissioners. They do not meet National Standards on a regular basis. Washoe County Volunteer Fire Departments utilize the services of ECOMM for its dispatch services. The largest flaw within the system is that the time stamp criteria does not divide the incident into hundreds of a second. An example is that at each dispatch milestone (receipt of call, dispatch of call, units arrival at scene etc. there could be up to a 59 second error on each time stamp. For example if the call comes in at 14:02 PM, it could actually come in at 14:02:00 PM or 14:02:59 PM offering up to :59 second error at every time stamp. A total response could be significantly altered based upon this information. This a Service Level Objectives established by the Board of County Commissioners. That coupled with average response times, rather than fractile response times does not allow for an accurate accounting of fire department operations.

Deployment – Distribution and Concentration

Deployment is measured and typified from two concepts, which are influenced by response time and create an effective response force for *each risk category*:

- **Distribution:** The locating of geographically distributed, first-due resources, for *all-risk* initial intervention. These station locations(s) are needed to assure rapid deployment to minimize and terminate average, routine emergencies.

Distribution is measured by the percentage of the jurisdiction covered by the first-due units within *adopted public policy response times*. Policies shall include “benchmarks” for intervention such as: arrival prior to or at flashover; arrival on EMS incidents prior to brain death in cardiac arrest. From risk assessment and benchmark comparisons, the jurisdiction will use critical task analysis to identify needed resource distribution and staffing patterns.

A sample distribution policy statement could be:

*“For 90% or 4 minute response time of all incidents, the first-due unit shall arrive within six minutes **total reflex** time. The first-due unit shall be capable of advancing the first line for fire control **or** starting rescue **or** providing basic life support for medical incidents.”*

Concentration: the spacing of multiple resources arranged (close enough together) so that an “effective response force” can be assembled on-scene within *adopted public policy* time frames. An “initial” effective response force is that which will most likely *stop the escalation* of the emergency for each risk type.

- o Concentration is measured by risk category type - high-risk areas need second and third due units in shorter time frames than in typical or low risk areas.

Concentration pushes and pulls distribution and there is no one perfect mathematical solution. Each agency after risk assessment and critical task analysis has to be able to quantify and articulate

why its resource allocation methodology meets the governing body's adopted policies for initial effective intervention on both a first-due and multiple unit basis.

Washoe County Volunteer Fire Departments have determined that a single fire station will serve each of their small communities. Response times are based on availability of Firefighters to respond to the fire station, get into their protective clothing and respond the apparatus to the scene. This is a hit and miss system based solely on the availability of qualified firefighters based on the incident. Back up units will be dispatched from a distant location and they may not arrive before the incident has escalated, or has been mitigated.

Performance and Reliability

How reliable is your response system, does the agency frequently see multiple calls for service (stacked, or queued calls) and do these degrade performance? Are there predictable times of the day, week or year when queued calls occur? Can these occurrences be controlled or can peak hour staffing be used?

Performance and Reliability is not consist in a volunteer fire department, nor the ability to answer dual calls in any predictable manner

Overall Evaluation

Statistics may say one thing, but they may totally disagree with the real world experience. If so, find out why and keep studying until the numbers come close to reality. Then based on good data, compare and contrast the study findings to community needs, expectations and the ability to afford. All elected officials should be presented with a cost-benefit analysis, not just a demand for a change.

Washoe County is fortunate to have citizens that are committed to their individual communities and provide volunteer firefighting and EMS services. This is a cost effective way to provide a service that would otherwise burden an economically challenged County.

Risk Assessment

Each community has risks. Risks are based on the probability of an event occurring and the consequences of that event occurring. Each creates different requirements in the community for commitment of resources. We have divided the risk assessment into four major components:

- Low Probability, Low Consequences
- Low Probability, High Consequences

- High Probability, Low Consequences
- High Probability, High Consequences

- Distribution is an equity issue between neighborhoods
- Concentration is a risk/cost issue *and*

Both are variables, thus:

Increased Risk = Increased Concentration

For example, the risk assessment for Washoe County Volunteer Fire Departments may include defining the differences between a detached single-family dwelling, a multiple family dwelling, or an industrial building by placing each in a separate category on this model. Fire stations and apparatus may have to be equally distributed in the community to provide an initial attack service to all of them. Conversely, the fire station locations and staffing patterns must be prepared to respond to a need for worst-case scenarios. There are many factors that make up risk: the ability of occupants to take self-preserving actions, construction features, built-in fire protection, fire flow, nature of the occupancy or its contents, etc.

While risk factors all have some common thread, the rationale of placing an occupancy within any risk assessment category is to assume the worst. Fire flow as a risk assessment criteria or requirement is based on defining the problem that will occur if the occupancy is *totally involved*, and therefore creates the maximum demand upon fire suppression services.

The level of service provided by an agency should be based on the agency's ability to cope with the type and size of emergencies that are *reasonably* expected after conducting a risk assessment.

Building (Occupancy) Risk Assessment

The Fire Flow concept of occupancy risk assessment addresses one of the most important aspects of fire control; the assessment of water supplies needed once a structure has become fully involved. The fire flow method does not address other equally important issues such as occupant risk and content vulnerability to fire origin.

In most communities the majority of losses occur in the smallest percentage of emergencies that reach the significant, major or total destruction loss ranges. The objective of risk assessment technique is to reduce the truly serious loss to a very unusual event in the community. This involves trying to keep routine emergencies from becoming serious loss situations.

Evaluating Capabilities For Structural Firefighting

Dynamics of Fire Growth & Flashover

The answer for controlling the variation in the fire dynamics lies in finding a common reference point, something that is common to all structure fires regardless of the risk-level of the structure, the material or the time the fire has burned. Such a reference point exists. Regardless of the speed of growth or length of burn time, all fires go through the same stages of growth. And one particular stage emerges as a very significant one because it marks a critical change in conditions. It is called flashover.

The flashover stage of a fire marks a big turning point in fire conditions that escalates the challenge to a fire departments resources. How and why this is so is explained in the following descriptions of each stage of fire growth:

Smoldering Stage - This is the first stage of any fire. When heat is applied to a combustible material, the heat oxidizes the material's surface into combustible gases. The oxidation process is exothermic; meaning that the oxidation process itself produces heat. The heat from oxidation raises the temperature of more material, which increases the rate of oxidation and begins a chemical chain reaction of heat release and burning.

A fire can progress from the smoldering phase immediately or slowly, depending upon the fuel, nearby combustibles and the surrounding air. For example, a wad of newspapers will smolder only a few seconds before progressing to the next stage, but a couch with a burning cigarette may continue smoldering for over an hour.

Incipient Stage - When the temperature gets high enough visible flames can be seen; this stage is called incipient or open burning. The visible burning at this stage is still limited to the immediate area of origin. The combustion process continues to release more heat that in turn heats nearby objects to their ignition temperature, and they begin burning.

Flashover - Flashover signals the transition of a room fire from the growth stage to the fully developed stage. It is the most dangerous part of a fire. At some fires there is a sudden conversion of smoke and heat into flame. Not all the combustible gases are consumed in the incipient stage. They rise and form a superheated gas layer at the ceiling. As the volume of this gas layer increases, it begins to bank down to the floor, heating all combustible objects regardless of their proximity to the burning object.

When this radiation "feedback" heat raises the temperature of the combustible gases and furnishings in the burning room to their ignition, flashover can suddenly occur. The smoke-filled room can burst into flames and a rapid escalation occurs, resulting in a full-room fire involvement.

Flashover has killed many firefighters. The most dangerous phase of a fire's growth is when it goes from its growth stage to the fully developed stage. Flashover signals the end of the growth stage and the beginning of the fully developed stage. Flashover doesn't occur at every fire, but it can occur in any type of room fire.

Fire Spread - is the most common way a building fire grows. It spreads through open doors, unenclosed stairs and shafts, and by "auto exposure" (flames leaping from a window above in the same building). This is called convection the transfer of heat by fluids such as liquid or gas. Fire can spread by three

methods of heat transfer: conduction, convection and radiation.

As an example of fire spread by *convection heat* is when flames concealed in the wall space travel up several floors and break out in an attic. Convection heat rises. Heated air expands, becomes lighter than the surrounding air and rises. When checking for fire extension, go to the floor above the fire. Convection heat currents in the form of flame, heat, smoke and heated combustible gases will be found there.

The transfer of heat by *radiation* is a major fire spread problem at large fires. Fire in a fully involved heavy timber, or wood-frame dwelling will spread by radiated, defined as heat transfer from one body to another by heat rays through space.

Flashover

The following discussion describes why flashover is such a significant fire event, and explains why preventing this stage of fire behavior is appropriate for evaluating fire department capability.

Fire department performance capability is easy to measure, but at the same time difficult to interpret. Specific performances are not difficult to record. Travel time data will show how long it will take to get fire companies to a fire at point X. Likewise, fireground tasks like operating an attack line or raising ladders are easy to measure. But these measurements by themselves don't say what can be accomplished in the time frames recorded. More needs to be known before concluding what the fire companies are capable of when they get to a fire. Two significant factors that must be known are:

- The threat of the fire - is it small and isolated from other combustible material? Are occupants trapped by smoke or flames? How fast is it growing?
- The number of fire suppression tasks involved - a small fire with little smoke might require only a few firefighters to extinguish it and remove smoke from the building. A larger fire will require a greater number of firefighters, and a fire where lives are threatened will require still greater numbers of firefighters.

To make valid comparisons of fire department capability, the comparisons must evaluate the variation in the fire threat factor and the fireground task factor. The dynamics of fire growth interrelate with various configurations of fire station location, built-in fire protection and staffing patterns as a result of different scenarios of fire growth. The fire suppression tasks that are required at a typical fire scene *vary a great deal depending upon risk level*. What the fire companies must do, simultaneously and quickly, if they are to save lives and limit property damage is to arrive at the right time, with adequate resources to do the job. Matching the arrival of resources with a specific point of fire growth is one of the greatest challenges to fire managers.

Flashover is a critical stage of fire growth for two reasons. First, no living thing in the room of origin will survive, so the chance of saving lives drops dramatically.

Second, flashover creates a quantum jump in the rate of combustion, and a significantly greater amount of water is needed to reduce the burning material below its ignition temperature. A fire that has reached flashover means it is too late to save anyone in the room of origin, and a lot more staffing is required to handle the larger hose streams needed to extinguish the fire. A post-flashover fire burns hotter and moves faster, compounding the search and rescue problems in the remainder of the

structure at the same time that more firefighters are needed for fire attack.

Fire station location and staffing levels are predicated on a particular point where the fire's growth causes a significant shift in the fire's behavior and moves into the flash point. At this point, the room has been untenable for some time before flashover. Arrival of resources pre-flashover may limit the fire to a single room. Post flashover requires larger hose lines and additional resources.

<i>Pre - Flashover:</i>	<i>Post - Flashover:</i>
Limited to one room	May spread beyond one room
Requires smaller attack lines	Requires larger, more attack lines
Search & Rescue is easier	Compounds Search and Rescue
Initial assignment can handle	Requires additional companies

To summarize, the stage of a fire affects staffing and equipment needs. Both can be predicted for different risk-levels and fire stages. This ability to correlate staffing and equipment needs with a fire's stage of growth is the basis for a standard of response coverage analysis by a fire department. Nevertheless, it is unreasonable to expect a fire department to reach all fires before flashover, even the most heavily staffed and best equipped department.

The community's expectation may be that the fire department will arrive at all fires prior to flashover. The reality is that some fires will reach flashover before arrival of the fire department. The value of sprinkler systems, especially residential sprinkler systems, comes into sharp focus when considering the absence of flashover.

The challenge for fire departments today is to provide a deployment policy that is cost effective while matching that deployment to a specific point in the fire growth and prior to flashover. The deployment cannot be solely based on the dynamics of fire, but must also include the arrival of resources at medical emergencies prior to irreversible brain damage.

Performance Expectations - On Scene Operations Critical Tasking

It is known that the variables of fire growth dynamics and property/life risk combine to determine the fireground tasks that must be accomplished to stop the loss. These tasks are interrelated but can be separated into two basic types, fire flow and life safety. Fire flow tasks are those related to getting water on the fire. Life safety tasks are those related to finding trapped victims and removing them from the building.

The required fire flow is based on the building: its size, structural material, distance from other buildings, horizontal and vertical openness (lack of partitions), and its contents -- type, density, and combustibility (BTU's per pound). Fire flow tasks can be accomplished with hand held hoses or master streams (nozzles usually attached to the engine or ladder). The decision to use hand lines or master streams depends upon the stage of the fire and threat to life safety.

If the fire is in a pre-flashover stage, the firefighters make an offensive attack into the building with hand lines. The lines are used to attack the fire and shield trapped victims until they can be removed from the building.

If the fire is in its post-flashover stage and the structural damage is a threat to the firefighter's life safety (e.g., weakened roof, stairs), then the structure is declared lost and master streams are employed to keep the fire from advancing to surrounding buildings.

Areas with very large and very valuable buildings can require fire flows of 3,000+ GPM. The staffing needed to generate these fire flows can also be calculated.

The life safety tasks are based upon the number of occupants, their location (e.g., a low rise vs. high rise), their status (awake vs. asleep), and their ability to take self-preservation action. For example, ambulatory adults need less assistance than non-ambulatory. The elderly and small children always require more assistance.

- **The key to a fire department's success at a fire is coordinated teamwork, regardless of whether the fireground tasks are all fire flow related or a combination of fire flow and life safety.**

The fire attack practices used by most fire departments are similar throughout the country for organized fire departments. Activities at fires should also conform to nationally recognized safe practices for structural firefighters, and comply with federal Occupational Safety & Health Administration (OSHA) rules for the same such as the "2-in/2-out" policy.

It is highly unlikely that Washoe County Volunteer Fire Departments can meet the 2-in/2-out Safety Policy and therefore must attack structure fires from the exterior, or protect exposures including the Wildland.

Identifying Critical Tasks

When identifying critical tasks, firefighter **safety** must come first. Whenever interior fire operations are to be accomplished, which require the use of protective equipment, including turnout gear, SCBA, and a minimum of 1-1/2 inch hose line, additional personnel must be staged to perform rescue functions for interior firefighting personnel and a command structure should be in place. Since the OSHA 2-in/2-out standard, all agencies will follow that definition of hazardous atmosphere and have in place both an Initial Rapid Intervention Team (IRIT) and well as a full company as a Rapid Intervention Team (RIT) as the effective response force assembles on scene.

Some sample individual critical tasks at structure fires are listed below:

Attack Line - A medium sized hose that produces 100+ GPM and is handled by a minimum of two firefighters, or a larger hose that produces 200+ GPM and is handled by 3 or more firefighters. Each engine carries a set of attack lines that are either pre-connected to the pump, are folded on the hosebed, or in a special pack for carrying into mid-rise buildings.

The selection of which attack line to use depends on the type of structure, the distance to the seat of the fire, and the stage of the fire. The pre-connected lines are the fastest to use but are limited to fires within 150' of the pumper. When attack lines are needed beyond this limit, the hose bed lines or high-rise lines are used. A larger attack line will be used when the fire is already beyond the flashover stage and threatens an unburned portion of a structure.

Search and Rescue - A minimum of two firefighters assigned to search for living victims and remove them from danger while the attack crew moves between the victims and the fire to stop the fire from advancing to them. A two-person crew is normally sufficient for most moderate risk structures, but more crews are required in multi-story buildings or structures with people who are not capable of self-preservation.

Ventilation Crew - A minimum of two firefighters to open a horizontal or vertical ventilation channel when the attack crew is ready to enter the building. Vertical ventilation or ventilation of a multi-story building can require more than two firefighters. Ventilation removes superheated gasses and obscuring smoke, preventing flashover and allowing attack crews to see and work closer to the seat of the fire. It also gives the fire an exit route so the attack crew can “push” the fire out the opening they choose and keep it away from endangered people or unburned property. Ventilation must be closely timed with the fire attack. If it is performed too soon, the fire will get additional oxygen and grow. If performed too late, the attack crew cannot push the fire in the direction they want. Instead, the gases and smoke will be forced back toward the firefighters and their entry point, which endangers them, any victims they are protecting, and unburned property.

Back-up Line - Usually the same size as the initial attack line that is taken in behind the attack crew to cover the attack crew in case the fire overwhelms them or a problem develops with the attack line. This needs a minimum of two firefighters. A larger line staffed by three or more firefighters will be used for back up instead of a medium line where the type of fire is one that could grow rapidly if not stopped by the attack line.

Rapid Intervention Team (RIT) - A minimum of two firefighters equipped with self-contained breathing apparatus (SCBA) and available near the entry point to enter the structure and rescue the attack, S & R, or back up crew if something goes wrong.

Exposure Line - Any sized attack line or master stream appliance staffed by two or more firefighters and taken above the fire in multi-story buildings to prevent fire expansion. Also used externally to protect nearby structures from igniting from the radiant heat.

Engineer - One firefighter assigned to deliver water under the right pressure to the attack, back up and exposure lines, monitor the pressure changes caused by changing flows on each line, and ensure that water hammer doesn’t endanger any of the hose line crews. This firefighter also completes the hose hookups to the correct discharges, and completes the water supply hookup to the correct intake. The Engineer can sometimes make the hydrant hookup alone if the pumper is near a hydrant (50’), but the hydrant sometimes precludes this.

Water Supply - A crew of one or more firefighters who must pull the large diameter hose between the pumper and the nearest hydrants if not laid out on the way in, provide hookup to the hydrant and deliver a water supply to the pumper before the pumper’s water tank runs dry. Depending on the fire flow required, this could take several additional vehicles with the resultant number of operators.

Command - An officer assigned to remain outside of the structure to coordinate the attack, evaluate results and redirect the attack, arrange for more resources, and monitor conditions that might jeopardize crew safety.

Safety Officer - An officer assigned to remain outside of the structure to coordinate the attack, evaluate

results and redirect the attack, arrange for more resources, and monitor conditions that might jeopardize crew safety.

The following table shows how critical tasks might be listed by risk type:

Representative Tasks Necessary at a Moderate-Risk Structural Fire

TASK	FIREFIGHTERS
Attack Line	2
Back-up Line	3
Search & Rescue	2
Ventilation	2
Rapid Intervention Team	2
Pump Operator	1
Aerial Operator	1
Command	1
Total:	14

This level of resources can set up the equipment and simultaneously handle the tasks of fire attack, search & rescue, ventilation, backup lines, pump operation, water supply and command, all within a few minutes. If fewer firefighters and equipment are available, or if they have longer travel distances to cover, then the department will not be able to provide an objective like confining the fire near or within the room of origin.

Since the average time from a fire's incipient stage to flashover is six to ten minutes, the travel times selected for any fire agency should allow the fire district to arrive before flashover in the majority of cases (about 4 out of 5). The advent of automatic residential and commercial sprinklers has greatly enhanced the organizations ability to provide this level of service. Total reflex times are longer than the flashover time, but this is compensated for by the fact that a portion of the fires will still be in the smoldering or incipient stage when reported, which will normally mean a longer time before flashover occurs.

In the long run, then, the fire department will get to most fires before or at the time they reach flashover. The other one-in-five fires that are not reached before flashover are those cases noted earlier where the fire went to flashover rapidly because flammable accelerants were present or because the fire burned a long time before being reported.

The next step in displaying critical tasking is to aggregate the tasks into typical company groupings. While tasks will vary depending on individual tactical situations, such a grouping by company will allow the elected officials to see the tasks by units as well as by individuals.

Most Washoe County Volunteer Fire Departments do not have the numbers of volunteer staffing to accomplish the above outline fireground activities. The ability for Career departments to supplement the Volunteer Fire Departments is unlikely due to the very long response time and distances from the Volunteer communities. Fire Suppression Operations must take place in a sequential manner rather than having concurrent (multiple activities occurring during the same time) manner. This is due to lack of staffing, lack of multiple units arriving within a reasonable time frame and the general availability of trained personnel.

Effective Response Force

An Effective Response Force is defined as the minimum amount of staffing and equipment that must reach a specific risk location within a maximum prescribed total reflex time that is from the time of call receipt to the units being on-scene.

An effective response force should be able to handle fires that are reported shortly after they start and are within the maximum prescribed time for the full assignment of fire companies according to the risk level of the structure. In any staffing and response study, the staffing, equipment and times that accompany each of the risk categories should be based upon that premise.

Considering that the fire department cannot hold fire risk to zero, a response cover study's objective should be to find a balance between distribution, concentration and reliability that will keep fire risk at a reasonable level, and at the same time yield the maximum savings of life and property at the least cost. The maximum prescribed travel times act as the limit to effectiveness - if you put fire stations too far apart, the minimum effective response force cannot get to a fire in time.

The following table is another way as part of critical task analysis, to show in a matrix Washoe County Volunteer Fire Departments base line fire flow response goals by number of engines:

Base Line Fire Flow Response Goals

RISK TYPE	GPM'S	Number of Engine Companies (4 per crew)
Maximum	4,000+ gpm	6
Significant	3,000+ gpm	5
Moderate	1-2,000 gpm	3
Low	<1,000 gpm	2

It is important to get all the required firefighters to a fire scene quickly because fire suppression is a simultaneous and coordinated activity.

At a fire in an occupied structure, a minimum of eight tasks must be simultaneously conducted in order to stop the loss of civilian lives, stop further property loss, and do so while keeping the risks to the firefighters' lives at a reasonable level. The number and type of tasks that need simultaneous action will dictate the minimum number of firefighters needed at different types of fires.

Additional resources are required for assignments such as operations, planning, logistics and finance.

It is unlikely that Volunteer Fire Departments can meet the Low Risk, less than 1,000 GPM fire flow delivered by a minimum of 8 firefighters with two engine companies. The Volunteer Fire Departments just do not have the staffing to deliver such services.

Event Initiation

The point at which factors occur that may ultimately result in an activation of the emergency response system; or the time period in which an individual has clearly identified that there is a threat to life and property and that remedial action must be taken immediately or there will be definable losses.

Precipitating factors can occur seconds, minutes, hours, or even days before a point of awareness is reached. A patient who ignores chest discomfort for days until it reaches a critical point, at which the patient makes a decision (point of Awareness) to seek assistance. Rarely is it possible to quantify the point at which event initiation occurs.

Emergency Event

The point at which an awareness of conditions exists that requires an activation of the emergency response system. Considered the Point of Awareness, it may be the recognition by an individual that assistance is needed, or it may consist of a mechanical or electronic recognition of an event such as smoke or heat detector activation.

Alarm

Alarm is defined as the *period of time* in which a human being or mechanical device takes to detect a set of circumstances that require response on the part of public safety forces to locate, access and begin to communicate with a public safety agency that is required in order to mitigate the emergency. Alarm notification time includes the dialing of telephones, the completing of circuits and all elements that are required for the transmission of coded messages or electronic impulses in order for the receiving party to identify that a state of emergency exists.

Alarm notification is distinguished from the normalcy state by virtue of the fact that the individual who is aware of the emergency realizes they must have extra assistance or that the mechanical device such as heat detectors, smoke detectors and sprinkler systems reach their minimum threshold and operate. This element also includes the activation of equipment to alarm receiving facilities such as Central Station and third-party providers. This is when the emergency is reported.

Notification

Commencement of notification is defined as the *point in time* when the first electrical impulse or indicator that can be identified and recorded by the public safety agency. This is the agency that is responsible to act/respond and start collection of hard data. In the Sierra Fire Protection District emergency calls first go to the PSAP (Public Safety Answering Point), which is the ?.

Alarm Processing or Dispatch Time

Alarm processing time is defined as the *period of time* that is required for the communications center to identify the fact that an emergency is in progress, collect the information pertinent to making the appropriate dispatch and access the methodology used by the agency to deploy its resources.

Alarm processing time is essentially the entire time interval between realization that an emergency is in existence up to the point that this information is retransmitted via the internal alarm system to the attention of the specific agency's resources. The benchmark for this element of response time is 95% of all alarms will be dispatched within a 60 second time frame.

Turnout Time

Turnout time is defined as the *period of time* that it takes for response personnel to discontinue the activities that they are engaged in, properly attire themselves, and board the vehicle in readiness for response. Turnout time shall include the elapsed time between notification alert of an emergency event in progress and the emergency vehicle actually beginning to respond to the identified address or location.

Travel Time

Travel time is defined as the *period of time* between the vehicles beginning their *uninterrupted* response and the actual time that the emergency response vehicle arrives at the address or location to which it has been dispatched. Travel time includes driving distance and delays caused by misinformation in the dispatch, traffic obstruction and/or geographical obstacles. Travel time ends when the vehicle is declared on-scene by the first arriving unit officer. The national response standard is based on 35-mpg average or 53.1 feet/second.

On-Scene Time

On-scene time is defined as the *point in time* that the first due responding emergency vehicle or responsible command officer arrives at the scene of an emergency and begins to take immediate action or take command of the rest of the response force. On-scene time is only accurate if the officer or individual in charge is in a position to actually begin to assess the nature of the emergency. Generally speaking, this is the same as the stoppage of the vehicle, but may be extended in the event of extremely large area buildings, wildland events that are significantly off the road, mid-rise and/or circumstances in which the original address was inaccurate requiring additional travel time.

Initiation of Action

This is defined as the *period of time* of actual involvement by the individual crewmembers or company in the reduction of the state of emergency at the scene. It is an indication of total commitment at the scene. This period is not terminated until such time as the fire officer or other individual with jurisdiction determines that the organized fire unit can be placed back in service and/or respond to an additional emergency.

Some fire agencies declare a unit as "in Service" but keep it on the scene for further activity. For purposes of defining fire service activity levels, a company is not to be considered to be free of an emergency until allowed to leave the scene.

Termination of the Incident

This is defined as the time when an event is declared terminated and all deployed agency resources are available for another assignment. The period of time between arrival and availability for response is measured by the factor of response reliability.

Total Response Time

Total response time is calculated from the time point at which the alarm is reported (notification) to the time point when units arrive at the emergency event (on scene).

If a state of normalcy exists, there is no need to call emergency services to the scene. However, once an event initiation begins and the cascade of events begins to unfold, the degree of loss of life and property that can be prevented may be impacted by the passage of time.

For purposes of this coverage document, response time is a compilation of the elements beginning with alarm processing time up to on scene time. It has three elements:

1. Alarm processing time
2. Turnout time
3. Travel time

Therefore, for purposes of definition and the need to establish a common benchmark for purposes of evaluating response time accreditation criteria, the following times should be made available and used in defining base line norms for a candidate agency:

Response Time -

- | | | |
|----------------------------------|---|---|
| A. Notification/Alarm Processing | = | 1:15 second benchmark |
| B. Turnout Time | = | 1:20 second benchmark |
| C. Travel Time | = | Based on criteria for the different risk categories |

Total Response Time = A + B + C

Washoe County Established Fire and EMS Response Times*

General Rural	Fire- EMS Response	20 + Minute Response Time
Rural Lands	Fire- EMS Response	10-20 Minute Response Time
Suburban Lands	Fire- EMS Response	5-10 Minute Response Time
Urban Lands	Fire –EMS Response	5 Minute Response Time

* Response time is measured from the time the initial call is received until the arrival of the first emergency vehicle

Source: Washoe County Comprehensive Plan, Land Use/Transportation Element, May 2007

Insurance Services Office

Insurance companies were the driving force in fire protection in the early 1800's. Insurance companies would issue to subscribers metal identification marks to be placed on the homeowners' dwelling, these marks served to notify fire companies that the dwelling was insured. Great fires in the 1800's were the rule rather than the exception. In the event of a fire, the first arriving fire company would be compensated for salvaging the belongings of the insured party. This system often led to general disruption at the scene of an emergency and often contributed to conflagrations.

The National board of Fire Underwriters was an organization that was concerned about the large fire loss and conflagration hazards in the 1800s. The NBFU began to survey large cities for its members to identify why large-loss fires in cities were occurring and how they might be prevented. In their surveys, they noted building conditions, fire department equipment and staffing, firefighting water supplies and other fire protection factors. When all of the material was put together from these surveys, it formed the embryo of today's Insurance Services Office ratings. Today's document is now known as "Standard Grading for Grading Cities, and Towns of the United States with Reference to their Fire Defenses and Physical Conditions". This "Grading Schedule" became one of the criteria by which insurance companies determine fire insurance rates for any given city or town. The Insurance Services Office continued to refine this process which is still in use today. ISO field engineers. These engineers examine and grade water supply, fire department equipment, operations, staffing, training, fire prevention, fire communications, building and code enforcement, building conditions, conflagration protection and records and reports. Each of the areas noted are given a maximum number of potential deficiency points. Large cities are only assessed on their fire loss in any year, smaller jurisdictions like Washoe County Volunteer Fire Departments are subjected to in-depth analysis by field engineers.

Relative Values and Maximum Deficiency Points

Feature	Percent	Points
Water Supply	39%	1950
Fire District	39%	1950
Fire Service Communications	9%	450
Fire Safety Control	13%	650

Relative Grading of Municipalities in Fire Defenses and Physical Conditions Points of Deficiency Class Of Municipality

0-500	Class 1
501-1000	Class 2
1001-1500	Class 3
1501-2000	Class 4
2001-2500	Class 5
2501-3000	Class 6
3001-3500	Class 7
3501-4000	Class 8
4001-4500	Class 9
More than 4500	Class 10

The ISO provides a fire defense grading to insure that Cities are not prone to large loss conflagrations. Insurance companies base their rates on these grades, consistent with State insurance regulations. This is one form of analysis of a fire department, but one that does not consider the many other important

components of a fire and life safety system. ISO does not grade emergency medical services, response to hazardous material incidents or disaster preparedness. This system of evaluating a fire department solely on its fire suppression capabilities has lost credibility with members of the International City Managers Association, the International Fire Chief's Association and many related professional fire service groups.

Washoe County Volunteer Fire Departments generally are rated an 8 by the ISO

Target Hazards for the Washoe County Volunteer Fire Departments

Gerlach

The tiny town of Gerlach may be small in size, but it's rich in history and natural wonder. Although the Western Pacific Railway established the friendly town in the early 1900s, the region has been inhabited for centuries. Ancient man found the area's spring water reserves, game and natural shelter inviting, while later travelers used the Black Rock Mountain as a compass on their way to California and Oregon's gold country. Visitors can still find evidence of the pioneers who passed through Gerlach in the form of name carvings on rocks in the area. The town's historic water tower, circa 1909, is another fascinating link to the past and is even listed on the National Register of Historic Places #81000385.



In addition Gerlach/Empire has a Gypsum Plant, Orient Farms and Geothermal plant.

Sutcliffe

Crosby's lodge

Red Rock

Red Rock does not have any identified special target hazards

General Risks for the Washoe County Volunteer Fire Departments

Type of Risk	Hazards within Risk
Residential Structure Fires	Life Safety, Exposure risks, Firefighter Safety, Property loss, Loss of tax base
Commercial Structure Fires	Life Safety, Exposure risks, Firefighter Safety, Property loss, Loss of tax base
Natural Disasters	Life Safety, Possible Multiple simultaneous events, Long duration Event, Long recovery, Loss of Tax base, Possible Hazardous Materials
Man- Made Disasters	Life Safety, Possible Multiple simultaneous events, Long duration Event, Long recovery, Loss of Tax base, Possible Hazardous Materials
Medical Emergencies	Infectious control concerns, Firefighter safety
Hazardous Materials	Life Safety, Long duration Event, Long recovery, Complex issues with Possible public exposure
Urban Search and Rescue	Life Safety, Possible Multiple simultaneous events, Long duration Event, Long recovery, Loss of Tax base, Possible Hazardous Materials, Specialized equipment needs
Wildland Fires	Life Safety, fast moving event, costly use of resources, can be long duration event, Long recovery, Threat to watershed
Urban Interface Fires	Life Safety, fast moving event, costly use of resources, can be long duration event, Long recovery, Threat to watershed, Possible loss of Significant amounts of homes, Firefighter Safety

EVALUATING EMS CAPABILITIES

Survival of cardiac death or in a fire preventing flashover is often time driven. The brain can only be without oxygen for a short period of time, i.e., four to six minutes. Rapid intervention is necessary to prevent brain death from occurring. From an emergency medical perspective, the service-level objective typically is to provide medical intervention within a six-minute timeframe, as brain damage is very likely at six minutes without oxygen. However, in a cardiac arrest situation, survivability dramatically decreased beyond four minutes without appropriate intervention. Intervention includes early recognition and bystander CPR. The research recommends using the Utstein reporting criteria for outcomes research and capture of the following time stamps/points in the cascade of events in an EMS call that should be tracked. Early defibrillation is often called the critical link in the chain of survival because it is the only way to successfully treat most sudden cardiac arrests. When cardiac arrest occurs, the heart starts to beat chaotically (fibrillation) and can not pump blood efficiently. Time is critical. If a normal heart rhythm is not restored in minutes, the person will die. In fact, for every minute without defibrillation, the odds of survival drop seven to ten percent. A sudden cardiac arrest victim who is not defibrillated within eight to ten minutes has virtually no chance of survival. The shortest possible

response times create the highest probabilities of resuscitation. An important evaluation point lost on most agencies is the time that crews reach patient side. Often the clock stops when the vehicle arrives or stops at the address. The key to a successful outcome is the point the patient is actually contacted. In larger complexes or at very large homes located within gated communities, this time period can be substantial and can most certainly affect the outcome due to delayed intervention.

Gerlach has addressed the medical need by establishing an ambulance service. Gerlach works with REMSA to meet half way between downtown response times and the rural communities. Residents of the area have made a informed decision to medical care when they chose to move to a very rural area, that is demonstrated when they need to travel into the more populated areas for specialized needs. The medical system is commensurate with the needs of the community.

Overall Evaluation of the Washoe County Volunteer Fire Departments

The Citizens of the remote areas of Washoe County have made a decision to provide fire and medical services by establishing Volunteer Fire Departments. Those Volunteer Fire Departments have tried to do the best they can with limited resources. Here are some comments and suggestions about how to continue to enhance the fire and life safety systems currently in place.

Citizens and Visitors to remote locations make a conscious decision that the services offered in metropolitan areas may not be available to them in remote areas. The Volunteer Fire Departments of Washoe County do the best they can with limited volunteers, limited training, limited funding and limited call volume. It is important for Washoe County to continue funding the volunteer fire departments and provide training through the Truckee Meadows Fire Protection District. Washoe County is fortunate to have such dedicated men and women to provide volunteer fire department services in the areas of this study.

Washoe County should continue to recognize and acknowledge the efforts of the volunteer firefighters within the system. Recruiting, retaining and training are very difficult for the volunteer fire departments and governmental acknowledgement helps

Washoe County should continue to seek opportunities to support, streamline, and provide equipment for the volunteer fire departments. The agreement with the tribal fire department is a great example of ways to accomplish this.

Washoe County Volunteer Fire Departments should continue to utilize mutual aid to augment their resources

Washoe County should continue to hold the Volunteer Fire Departments accountable for training, apparatus maintenance records and overall general administration. This may best be accomplished by blending the organizations into the Interlocal Agreement with Reno/Truckee Meadows Fire Protection District and monitoring the compliance on a quarterly basis